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# CHINA REPORT

## SCIENCE AND TECHNOLOGY

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## PHYSICAL SCIENCES

### STATE OF THE ART OF LASER RESEARCH, DEVELOPMENT ABROAD

Chongqing JIGUANG [LASER] in Chinese Vol 11, Monograph on Laser Crystals, Jul 78 pp 2-11

[Article by Zhang Ying [1728 5391] and Xue Shen [1331 6500]: "Development of Techniques of Growing Laser Crystals Abroad"]

[Text] I. Foreword

At present, foreign nations have already produced over 100 kinds of crystalline working materials for producing laser oscillation.<sup>1-7</sup> Structurally they can be classified into more than 10 types, such as corundum, garnet, calcium titanium, scheelite, fluorite, rutile, yttrium fluorite, and phosphorous limestone. The types of crystals include cubic, hexagonal, square, triangular, oblique, and monocline crystals. By chemical composition, there are monoxides, compound oxides, monofluorides, compound fluorides, and various salts. In addition, there are multicrystalline ceramics and film crystal lasers.

The emission wavelength of crystal lasers covers a range from 0.31 micrometers up to 3.02 micrometers.<sup>7</sup> The modes of operation include continuous, paracontinuous, high-repetition frequency, and single pulse of different pulse width. Because crystal lasers are characterized by a compact structure, large output energy and work per unit volume, and stable properties, they are welcomed by users. Crystal lasers have already been widely applied in distance measurements, laser radar, communications, information processing, holographic photography, underwater lighting, color television, microscopic processing, drilling and welding, and medical techniques. At present, massive numbers of various types of crystal lasers of relatively stable properties are being sold in foreign markets.<sup>8,9</sup> The energy of the pulse of the ruby laser can reach 1,500 joules,<sup>10</sup> and its peak output already reaches the order of kilomegawatts.<sup>11</sup> The output of the pulse of the mixed neodymium-yttrium-aluminum garnet laser has already reached 150 megawatts.<sup>8,9</sup> Continuous multiple mode output of the 8th-class series has already reached 1,100 watts,<sup>12</sup> and single mode output is about 30 watts.

The 0.532 micrometer multiple frequency output has already attained 2.2 watts.<sup>53</sup> The mixed dysprosium calcium fluoride laser can emit a continuous output of 150 watts under liquid nitrogen cooling, and the pulse output can reach 3 megawatts. The repeated frequency is 500 times/second.<sup>6</sup> The efficiency of the neodymium fluorine calcium phosphate reaches 8 percent.<sup>6</sup> The continuous output efficiency of the mixed compound holmium oxides-garnet laser can reach 5 percent.<sup>13</sup> The efficiency of the neodymium pentaphosphate has already reached 18 percent,<sup>14</sup> while the threshold value is only 4 milliwatts. This can be lowered to 1 milliwatt after improvement.<sup>15</sup>

As lasers are popularized and applied in the military, in scientific research, and in industrial and agricultural production, more and more demands will be placed on laser crystals. For this purpose, foreign nations in recent years have made relatively great progress in both technology and the search for materials. For example, high gain materials that have emerged in efforts to search for new materials include sulphur lanthium oxide, neodymium pentaphosphate, yttrium aluminate, gadolinium scandium aluminum garnet. Materials of high storage capacity include yttrium lithium fluoride, silicate oxide lime, mixed yttrium aluminum gallium garnet, zinc barium germanate. In addition, the Soviet revisionists have always paid a lot of attention to compound fluorides. The following is a brief introduction to some new laser crystals which have frequently been reported and which have won the people's interest in recent years abroad.

## II. Crystal Materials for Lasers Used Abroad

1. Monoxides. Besides the red ruby, there are yttrium oxide ( $Y_2O_3$ ), lanthium oxide ( $La_2O_3$ ), gadolinium oxide ( $Gd_2O_3$ ), erbium oxide ( $Er_2O_3$ ), and ytterbium oxide ( $Yb_2O_3$ ) and such rare earth oxides used to realize oscillations to produce a laser. These 1.5 multiple oxides are strong and have a high melting point and stable chemical properties (except for  $La_2O_3$ ). They are suitable for mixing in trivalent ions of rare earth elements. Of these,  $Er_2O_3:Tm^{3+}$  also sensitizes the basic material. The  $Er^{3+}$  ions in the crystal lattice of the basic material can transfer the energy they have absorbed to the excited ion  $Tm^{3+}$  and, in this way, increase the photoemission of the latter; moreover, the pump input can be better absorbed and utilized. Therefore a lower threshold value and a higher work efficiency can be obtained. But oxides of this type all have a very high melting point and are generally grown by the blaze-melting method. Their crystalline optical quality is not high. Therefore, the progress of research in recent years has not been great. If the method of growing them can be improved, there is still a future for development of these types of oxide crystals. In recent years, the emergence of sulphur lanthium oxide has caught people's attention. Mixed neodymium sulphur lanthium oxide is stable in air and insoluble in water. The photoemission efficiency of excited ions of rare earth elements is higher in

sulphur lanthium oxide than in lanthium oxide. According to reports,<sup>16</sup> when this type of crystal's optical quality reaches YAG, its slope efficiency is 8 to 12 times higher than YAG. This type of crystal is volatile and its melting point is relatively high. It oxidizes in air when heated to above 600°C. In vacuum or inert gases it decomposes and yields sulphur when heated to about 2000°C. Therefore it must be grown in a sealed crucible. This makes it difficult for observation and control. According to reports,<sup>17</sup> the Atomic Energy Commission of the United States supports the study of this material. In 1973, the upward induction method had already been used to grow the single crystal of mixed neodymium sulphur lanthium oxide of better optical quality of 6 millimeters in diameter x 8 millimeters in length. However, the problem of evaporation of sulphur has not been solved.

Besides sulphur lanthium oxide, sulphur yttrium oxide crystals have also been grown abroad. The melting point of sulphur yttrium oxide is higher than sulphur lanthium oxide, it is hard, and its thermoconductivity is high. It is possible that sulphur yttrium oxide may be better than sulphur lanthium oxide. At present, these crystals cannot be grown to a large size. The techniques of growth still require further research.

2. Compound fluorides. These include aluminum garnets of rare earth elements such as yttrium aluminum garnet, lutecium aluminum garnet,<sup>17,18</sup> yttrium scandium aluminum garnet,<sup>19</sup> yttrium vanadium aluminum garnet,<sup>20</sup> yttrium chromium aluminum garnet,<sup>21</sup> yttrium gadolinium aluminum garnet, and yttrium vanadium thulium aluminum garnet, etc. The second kind includes the gallium garnets of rare earth elements such as yttrium gallium garnet and gadolinium gallium garnet, etc. Recently, another type of mixed aluminum-gallium garnet of rare earth elements has emerged, such as mixed yttrium aluminum gallium garnet.<sup>22,24</sup> These types of compound oxide crystals are very hard, have superior mechanical and thermal conductivity and stable chemical properties.

Yttrium aluminum garnet was successfully developed in 1964. After 10 years of continuous improvement, the crystal can now be mass-produced stably. The trend of future development of this crystal is toward improving the optical quality of the crystal, raising its efficiency, reducing the cost, and thickening the crystal. Large crystals of a diameter of 40 millimeters x 200 millimeters were already reported in 1971.<sup>25</sup> At present, YAG is still the leader of the laser crystals.<sup>26</sup>

Gadolinium scandium aluminum garnet is a new crystal, first reported only in 1974. Its physical and chemical properties are similar to YAG, but its fractional condensation coefficient of excited ions is higher than YAG. The fractional condensation coefficient of  $\text{Nd}^{3+}$  in YAG using the pulling method is 0.18, while the fractional condensation coefficient of  $\text{Nd}^{3+}$  in gadolinium scandium aluminum garnet is 0.61; thus its rate of growth is fast. The ordinary pulling speed is 2 millimeters/hour.

Early reports noted that this type of crystal's quality factor was lower than that of  $\text{YAG:Nd}^{3+}$ , about 0.81 times. At present, its light loss is high, its threshold value is relatively high, and its slope efficiency is lower than  $\text{YAG:Nd}^{3+}$ . It is said that it is possible to lower the light loss through improvements.

Since 1972, foreign countries have reported on a kind of mixed yttrium aluminum gallium garnet. It is a kind of medium gain high storage capacity laser crystal. Its physical and chemical properties are the same as those of YAG, but its absorption of the spectral line is 4 times wider, so there is more overlapping with the pump source, and therefore it is possible to elevate the efficiency. It is also a kind of crystal with a high energy storage.

3. Simple fluorides. This type of crystal requires low temperatures for operation and is not convenient to use. The quality is also relatively soft, and therefore its application is limited.

4. Compound fluorides. According to reports, these are irregularly structured solid solutions. They are characterized by the presence of large numbers of (several hundred) excitation centers inside the body of the crystal. When oscillating, energy transfer by self-oscillation and resonance may occur among the excited ions. Therefore, when the concentration of the injected and excited ions is high, the concentration will not suddenly dissipate. Another advantage is that when the crystal oscillates under high temperatures, its characteristics will not deteriorate. For example, the mixed neodymium fluorine yttrium calcium sodium crystal will operate at 1,000K, and under 450K it can still retain a very high efficiency.

It is worth pointing out that in recent years there have been more reports abroad on yttrium lithium fluoride.<sup>27,30</sup> It is believed to be a laser crystal of medium gain and high energy storage and one with a future for development. Its characteristic is that its fluorescence has a long life, about 500 microseconds--2.5 times that of  $\text{YAG:Nd}^{3+}$ . Its cross-sectional surface for laser jumps is large, about  $3.2 \times 10^{-19}$  square centimeters. Its optical intensity is high, and it does not reject exposure to light for overly long periods. Using pulses rich in short ultraviolet light to pump the crystal will not cause any damage. But its efficiency is not as good as  $\text{YAG:Nd}^{3+}$ . In experiments under identical conditions, the efficiency of  $\text{YAG:Nd}^{3+}$  is 1.5 percent, while YLF has an efficiency of only 0.82 percent. According to reports, the efficiency of that crystal may be raised by using  $\text{Cr}^{3+}$  to sensitize  $\text{Nd}^{3+}$  to fluorescence and to improve the optical quality of the crystal.<sup>27</sup>

Reference<sup>57</sup> reported on a kind of laser material  $\text{LiYF}_4:\text{Gd}^{3+}:\text{Tb}^{3+}$  of 0.5445 micrometers, operational at room temperature. For many years, it has been used in underwater lighting and treatment of eye disease in which a green light laser is needed. This is accomplished by using frequency

amplification techniques to convert the 1.06-micrometer laser. Because frequency amplification has a low efficiency and mechanical components are complex, application in this regard has been difficult. The emergence of  $\text{LiYF}_4:\text{Gd}^{3+}:\text{Tb}^{3+}$  can provide an 0.5445-micrometer laser of green light directly without frequency amplification. This is worth noting. Recently,  $\text{Li(Y,Er)F}_4:\text{Tm}^{3+}:\text{Ho}^{3+}$ <sup>58-62</sup> has been actively studied. The output wavelength of this kind of laser crystal mixed with  $\text{Ho}^{3+}$  is 2.0654 micrometers, and the laser can operate at room temperature. Atmospheric transmission studies show the dispersion of a 2-micrometer laser in the atmosphere is half that of a 1-micrometer laser. The transmission rate of the 2 micrometer laser in fog where visibility is 5 kilometers reached 67 percent, slightly better than that of a 1.06 micrometer laser under the same conditions. When studying the reflection by various target materials of typical military equipment (such as aluminum, titanium alloys, or cement), especially when the background of the target materials was grassland or forests, the 2-micrometer wavelength laser showed a superior contrast to the 1.06-micrometer laser. The  $\text{HgCdTe}$  infrared detector currently being studied was able to match the wavelength of the responding peak value of the light spectrum of 2.06 meters via selective grouping ( $\text{Hg}_{0.53}\text{Cd}_{0.47}\text{Te}$ ). This has provided a good receiver for this type of lasers. In addition, the 2-micrometer wave is not harmful to human eyes. Therefore, the success in the research of  $(\text{Y,Er})\text{F}_4:\text{Tm}^{3+}:\text{Ho}^{3+}$  has provided a new type of working material for lasers of 2.06 micrometers of medium infrared wavelength that have a high efficiency and are operational at room temperatures for laser distance measuring instruments and laser target indicators.

$\text{LiYF}_4$  belongs to the square crystal system. The crystal lattice has a constant of  $a=5.17$  angstroms,  $c=10.8$  angstroms, a density of 5 grams/cubic centimeter, Vicker's hardness of 260-350, thermoconductivity of  $15 \times 10^{-3}$  Calories/centimeter, second degree, a thermal expansion coefficient of  $11.5 \times 10^{-8}$ /degrees, and a melting point of  $830^\circ\text{C}$ . The improved upward induction method (TSSG method of growth with solution on the head of the inoculating crystal) and the reducing method of growing crystals inside the crucible of a temperature-gradient furnace have been used to grow crystals of  $\phi 13 - 20 \times 70 - 100$  millimeters in length and of better quality.

5. Various salts. These include aluminates, phosphates, germanates, vanadates, tungstates, molybdenates, and niobates.

1) Aluminates. These include yttrium aluminate, gadolinium aluminate,<sup>31</sup> calcium aluminate,<sup>32,33</sup> lanthium aluminate,<sup>34,35</sup> strontium aluminate,<sup>36</sup> etc. These acid salts are very hard and have good mechanical properties and thermoconductivity. The most representative of these is yttrium aluminate.

Yttrium aluminate's physical and chemical properties are similar to those of YAG, but because it has an orthogonal crystalline structure, it is anisotropic, and thus has some uniquely superior properties compared to YAG.

For example: (a) Gain varies in the rod axial direction, and thus its gain is adjustable; (b) the fractional condensation coefficient ideally approaches 1; thus higher concentrations of neodymium or mixing agents of other rare earth elements can be injected, and the conversion efficiency is higher; (c) the continuous laser output is polarized light. This reduces loss when adjusting the Q switch or when frequency amplification is plugged in; (d) the rate of growth of the crystal is faster than YAG, the cost is low, and large crystals with evenly mixed impurities can be easily pulled.

Reference<sup>63</sup> gives the following comparative evaluation of the function of mixed yttrium neodymium aluminate and yttrium aluminum garnet crystals in several laser operating conditions:

(1) Long pulse: Under high power, the function of the b or c axis rod of Nd:YAlO<sub>3</sub> equals or is superior to that of Nd:YAG.

(2) Pulse Q switch: The b axis rod of Nd:YAlO<sub>3</sub> equals that of Nd:YAG. The output pulse of about 200 millijoules of the c axis rod of 5 x 50 millimeters of Nd:YAlO<sub>3</sub> contrasts favorably with the output pulse of about 100 millijoules of the Nd:YAG rod under the same conditions.

(3) Continuous multiple modes: The b axis rod of Nd:YAlO<sub>3</sub> surpasses that of Nd:YAG. The output wavelength is 1.0795 micrometers, maintaining linear polarization at least within 130 watts.

(4) Continuous TEM<sub>00</sub> mode: The b axis rod of Nd:YAlO<sub>3</sub> surpasses the Nd:YAG. The b axis of 6.25 x 75 millimeters of Nd:YAlO<sub>3</sub> with the addition of a thermal double refraction compensator can produce a 13-watt TEM<sub>00</sub> mode laser. The stability among the peaks is about 2 percent.

In addition, yttrium aluminate's double refraction phenomenon can reduce distortion of heat and light. But the threshold value of YAP is higher than that of YAG and its continuous laser output is still not stable enough, thus destroying the relatively low threshold. All of these need to be further studied and overcome.

At present, the continuous multiple mode output of YAP:Nd<sup>3+</sup> is 100 watts and efficiency is 2 percent.<sup>37</sup> In addition, YAlO<sub>3</sub>:Tm<sup>3+</sup> is the only laser crystal of medium infrared wavelength that is operational at room temperatures.<sup>38</sup>

Mixed yttrium chromium aluminate is a kind of laser crystal with a high storage capacity. The concentration of the injected Cr<sup>3+</sup> ions can reach 1 percent (atoms) without causing sudden dissipation of the concentration. The concentration of Cr<sup>3+</sup> ions in red ruby is only 0.05 percent to 0.1 percent (atoms). When the concentration surpasses 0.1 percent (atoms), mutual action among the Cr<sup>3+</sup> ions causes sudden dissipation of the concentration and thus shortens the time of fluorescence. In addition,

mixing  $\text{Nd}^{3+}$  and  $\text{Er}^{3+}$  ions into this type of crystal as excited ions produces laser oscillation.

2) Phosphates. The threshold value of mixed neodymium fluorine calcium phosphate is low, its gain is high, its efficiency is high (reaching 8 percent), and its cost is low. Its most serious shortcoming is that its base material is brittle and it breaks easily when processed. Its thermoconductivity and its modulus of thermal elasticity are low, so that when continuous output power is greater than several watts, the crystal will be damaged. Therefore the development of this type of crystal is extremely limited. At present it has already been replaced by silicate oxide lime crystals.

Neodymium pentaphosphate ( $\text{NdPP}$ ) was first reported as a new crystal by the Bell Telephone Laboratories of the United States in 1972.<sup>39</sup> At present, this type of crystal is being studied by the Lincoln Laboratory of the Massachusetts Institute of Technology in the United States<sup>40</sup> and West Germany's Max Planck Research Institute.<sup>41</sup> Its characteristic  $\text{Nd}^{3+}$  is itself a part of the base material and is also an excited ion. Everyone knows the substitution percentage of excited ions in the basic material of crystals can only be around 1 or 2 percent (atoms). When a definite concentration is surpassed, the concentration will suddenly dissipate. Therefore, if the excited ions are used directly as part of the basic material without adding "impurities" of excited ions, in general, fluorescence cannot be observed. But neodymium pentaphosphate is an exception. People can observe fluorescence inside this type of crystal and can excite it to produce emission. The concentration of  $\text{Nd}^{3+}$  in the  $\text{NdPP}$  crystal is about  $4 \times 10^{21}$ /cubic centimeters, about 60 times higher than the amount of injected impurities (about 1 percent) of  $\text{YAG:Nd}^{3+}$ . (Editor's note: generally 30 times.)

The crystal is prepared so as to dissolve the  $\text{Nd}_2\text{O}_3$  in  $\text{H}_3\text{PO}_4$ , and then the solution is placed into a gold crucible and heated for 1 week at  $500^\circ\text{C}$ . Prismatic crystalline flakes of 0.1 millimeters thick and 2 to 5 millimeters long on the sides can be produced. The properties of  $\text{NdPP}$  are as follows: chemical formula is  $\text{NdP}_5\text{O}_{14}$ , spatial group  $\text{Pmna}$ , density 3.57 grams/cubic centimeter,  $z = 4$ , concentration of  $\text{Nd}$   $3.9 \times 10^{21}/\text{cm}^3$ , Moh's hardness 6 to 7. It is insoluble in any solvent. It remains inert in the atmosphere up to  $1000^\circ\text{C}$ . At  $1400^\circ\text{C}$ , it loses  $\text{P}_2\text{O}_5$  and melts into glass.

At present,  $\text{NdP}_5\text{O}_{14}$ ,  $(\text{Nd,Y})\text{P}_5\text{O}_{14}$ ,  $(\text{Sc,Nd})\text{P}_5\text{O}_{14}$  and  $(\text{La,Nd})\text{P}_5\text{O}_{14}$  crystals have been grown. These crystals also have another superior quality, which is that their threshold values are low. The  $\text{NdP}_5\text{O}_{14}$  crystal injected with a small amount of  $\text{Sc}$  and used to make a laser can be pumped by an argon laser. At room temperature, continuous oscillation can be obtained. The threshold value of continuous oscillation in a coaxial oscillation chamber of small loss is only 4 milliwatts. According to reports, under ideal

pumping conditions, the threshold value can still be lowered to a milliwatt. (Editor's note: There have been reports of 0.45 milliwatts.) The efficiency of the laser is about 18 percent. This type of crystal has a good future for application in small lasers and integrated optics.

The use of excited ions in a specific quantity as a component of the basic material that the crystal itself is composed of, where the basic material contains injected agents of excited ions, is a promising new path for growing laser crystals artificially. It seems that this will cause a wave of enthusiasm in research. Recently, there have also been reports of neodymium sodium tungstate ( $\text{NdNa}_5(\text{WO}_4)_4$ ),<sup>54</sup> holmium aluminum garnet ( $\text{Ho}_3\text{Al}_5\text{O}_{12}$ ),<sup>55</sup> and neodymium aluminum borate ( $\text{NdAl}_3(\text{BO}_3)_4$ ).<sup>56</sup> Activities along these lines should be emphasized.

3) Silicates. Silicate oxide limestone is a new crystal developed by the U.S. Westinghouse Company on the basis of calcium fluorophosphate. It is structurally the same as calcium fluorophosphate. Therefore it has the advantages of retaining a low FAP neodymium value and high efficiency, and its hardness, resistance to distortion, and resistance to destruction have all been increased. At present, experiments are being conducted with such crystals as yttrium calcium silicate oxide, lanthium calcium silicate oxide, and lanthium strontium silicate oxide. It has been discovered that lanthium calcium silicate oxide (melting point,  $2170^\circ\text{C}$ ) is a type of laser crystal with a relatively bright future. According to reports, the energy storage capacity per unit volume of this type of crystal is about five times that of  $\text{YAG:Nd}^{3+}$ . The silicate oxide limestone has provided a laser crystal of high average power for distance measurements and lighting.

In 1973, Soviet revisionists reported on a type of mixed lanthium yttrium silicate laser crystal.<sup>42</sup> This type of crystal is grown on the 1:1 system of  $\text{Y}_2\text{O}_3:\text{SiO}_2$ . Its melting point is  $1980^\circ \pm 30^\circ\text{C}$ . Its light permeable waveband is between 0.18 and 4.9 micrometers. Under room temperatures and 77K, the  $\text{Nd}^{3+}$  has two families of jumping spectral lines inside this crystal. One is  $^4\text{F}_{3/2} \rightarrow ^4\text{I}_{11/2}$ . Its major pumping spectral line has a wavelength of 1.075 micrometers. The second is  $^4\text{F}_{3/2} \rightarrow ^4\text{I}_{13/2}$ , which has a wavelength of 1.36 micrometers. In addition, gadolinium silicate crystals injected with  $\text{Ho}^{3+}$  and  $\text{Tm}^{3+}$  have also been grown.

4) Niobates. These include lithium niobate, calcium niobate, barium calcium niobate, and lanthium niobate. This type of crystals possesses laser and nonlinear frequency amplification properties. The lasers made from this type of crystals are called self-amplifying-frequency lasers. In recent years, foreign nations have paid attention to this type of crystals. The mixed lithium neodymium niobate laser, which has already been successfully developed, emits a wavelength of 1.0846 micrometers. At room temperature, the pulse threshold is 3.5 joules. The fluorescence life is 85 microseconds. Under 77K, the pulse threshold value of the mixed lithium thulium niobate crystal is 220 joules, the wavelength is 1.8532 micrometers, and its second-order harmonic wave has a wavelength of 0.9266 micrometers.

5) Beryllates. The U.S. Allied Chemical Corporation's materials research center recently reported on a new type of laser crystal, lanthium beryllate ( $\text{La}_2\text{Be}_2\text{O}_5$ ).<sup>65,66</sup> It belongs to the monocline crystalline system (spatial group, C 2/c). Its structure consists of a three-dimensional network of  $\text{BeO}$  quadrilateral divided evenly by distorted angles. In the  $\text{Be}^{2+}\text{O}_4$  quadrilateral is inlaid in a birdcage-shaped asymmetric  $\text{La}^{3+}$  squared dot (dot group  $C_1$ ) and coordinated irregularly with 10 oxygen atoms. The radius of the  $\text{La}^{3+}$  ions is large and can be used as square positions for injected rare earth ions. In  $\text{La}_2\text{Be}_2\text{O}_5$ , the large atomic weight of  $\text{La}^{3+}$  is concealed by the small atomic number and high molecular content of  $\text{Be}^{2+}$ . Therefore it provides a kind of basic crystal easily injected and grown, and possessing superior mechanical properties and thermoconductivity. Preliminary studies show that the mixed lanthium neodymium beryllate can continuously operate under room temperatures, and it has shown a high-efficiency and high-energy storage capacity under long pulse and Q switch modes of operation. The output is linear polarization approaching the TEM<sub>00</sub> mode.

The superior properties of lanthium beryllate have provided a bright future for the exploration of metallic salts as basic materials for lasers.

6. Multiple crystalline ceramics.<sup>43,44</sup> The multiple crystalline ceramic laser material is produced by the traditional baking method for ceramics. The material composition includes 80 percent molecular weight of yttrium oxide, 10 percent molecular weight of thorium oxide, and 1 percent molecular weight of neodymium oxide. This is a type of laser material of medium gain having a future for development. It can be used as a high-energy storage Q switch laser. Its superior properties include simple technology, low cost, and capability to inject high concentrations of rare earth impurities, alleged to reach 10 percent. Its thermoconductivity is five times greater than that of neodymium glass but only half that of  $\text{YAG:Nd}^{3+}$ . Measurements using the mixed neodymium multiple crystalline ceramic rod of  $\phi 6 \times 76$  millimeters show an efficiency of 0.1 percent. The threshold value of the laser is between 28 and 60 joules. This kind of material can also be used as window material for high-power lasers.

The large loss due to dispersion (about 2 percent per centimeter) is the major problem with this type of material. According to reports, this kind of loss due to dispersion may be reduced to 0.2 percent per centimeter via technological improvements.

7. Film laser.<sup>45,46</sup> Recently, the Bell Telephone Laboratories in the United States used the liquid-phase extension technique to grow single crystalline film of mixed neodymium yttrium aluminum garnet and mixed holmium yttrium aluminum garnet on the underlining of the YAG crystal. In the film of the single crystal of  $\text{YAG:Nd}^{3+}$ , a jump by  $\text{Nd}^{3+}$  corresponding to  ${}^4F_{3/2} \rightarrow {}^4I_{11/2}$  was observed under 77K and 300K. The wavelength is 1.06 micrometers and the fluorescence life is 150 microseconds. When using silver-plated film as a reflecting mirror, the pulse threshold value of film laser 7.2 millimeters long and 153 micrometers thick under 300K was

34 joules. In the film of the single crystal  $\text{YAG:Ho}^{3+}$ , the pulse and wavelength of continuous oscillation of  $\text{Ho}^{3+}$  corresponding to the  $^5I_7 \rightarrow ^5I_8$  jump observed under 77K was 2.1 micrometers. When using the silver reflecting mirror, the threshold value of this kind of laser was 70 joules. This type of film laser is a most recent development.

Reference<sup>67</sup> evaluated the comprehensive qualities of presently available crystal materials for lasers and noted that the characteristics of simple or compound oxides of the elements of Group III in the Periodic Table have proven to be the most hopeful materials among the presently available. These compounds are:  $\text{YAlO}_3$ ,  $\text{GdAlO}_3$ ,  $\text{LaAlO}_3$ ,  $\text{YScO}_3$ ,  $\text{LaScO}_3$ , and  $\text{LaGaO}_3$ . Selecting the best among them still requires further study. In exploration of new materials, attention must be paid to the study of a series of other chemical compounds. Of great hope among them are compounds composed of ions of rare earth elements and elements in the I, II and IV Groups which have invariant valence numbers. With the additional consideration of the demand of the mutual relationship of the replaceable ions in the crystal lattice and the corresponding crystal lattice of neodymium in the compounds, the following combinations can be derived preliminarily from the Periodic Table:

Group I:  $\text{LiRE}^+\text{O}_2$

Group II:  $\text{BaY}_2\text{O}_4$ ,  $\text{BaLa}_2\text{O}_4$ ,  $\text{ScY}_2\text{O}_4$ ,  $\text{ScGd}_2\text{O}_4$ ,  $\text{SrLa}_2\text{O}_4$ .

Group IV:  $\text{RE}_2\text{Zr}_2\text{O}_7$ ,  $\text{RE}_2\text{Hf}_2\text{O}_7$ .

Reference<sup>68</sup> believes that yttrium aluminate may be a potential substitute for YAG, and gives a lot of attention upon  $\text{YVO}_4$ . This is because  $(\text{VO}_4)^{3-}$  ions can absorb and transfer energy to  $\text{Nd}^{3+}$ . It is a material for sensitizing basic materials and is of interest to many. But the instability caused by chemical decomposition requires further research and improvement. The author of the above reference has placed heavy emphasis upon the exploration of solid working materials for lasers with new frequencies beyond 1.06 micrometers.

### III. Progress in the Techniques of Growing Laser Crystals Abroad

As working material for lasers, crystalline materials should have superior optical smoothness and large dimensions. These are the major technical difficulties present in many laser crystals. The development of laser techniques has stimulated in-depth research and improvement of the techniques of growing crystals. During this period, the techniques of growing crystals have obtained relatively great progress. Even greater progress will be achieved in the future to adapt to the needs of laser technology. Activities of the development are briefly described as follows:

1. Most of the laser crystals which have already been reported are grown by the upward induction method. A series of technological improvements have been made in the growth of laser crystals using the upward induction method. The following few points are worth our attention:

1) Ordinarily, inductive heating and the iridium crucible are used as the system for growing crystals. The means of adjusting the temperature include changing the shape of the crucible, the structure of the shield, and the aft heater. For amplifying frequency crystals, the unified method of growth and anneal system is used.

2) The crucibles mostly have a flat bottom. Those reported have a relatively thin wall (1 to 2 millimeters). Crystals with a melting point of 2180°C (strontium lanthanum silicate oxide) can be grown in the iridium crucible (melting point, 2450°C).

3) The heat source of inductive heating is usually 10 kilohertz and 405 kilohertz inductive heating equipment. According to reports, the use of 10 kilohertz equipment makes it easier for automatic control and is beneficial to reducing the radial temperature gradient of the surface of the melt and to prolonging the life of the crucible.<sup>17</sup>

4) There are many automatic control techniques for growth of crystals. In the growth of optical crystals, a more outstanding report concerns automatic control of the diameter.<sup>17</sup>

At present, the methods of automatic control most frequently used in production and research are the weighing method (using the electronic scale to weigh the crucible and the melt, or weighing the crystal and the crystal pulling rod) and laser control of the diameter. These methods have already been applied. The weighing method is used more often. After using the automatic diameter control method, the intensity of human labor in growing crystals has been greatly reduced, and the quality of the crystals and the percentage of production of crystals have been raised. For example, reference<sup>64</sup> reports that using the weighing method and the technique of controlling the diameter to grow yttrium aluminum garnet can appropriately control the variation of the diameter of the crystal and can change the boundary surface of growth and thus eliminate the nuclei formed by small crystal planes.

2. The method of growing crystals with high melting points without using a crucible has attracted a lot of attention. Because the exploration of laser crystals with high melting points is attractive, the study of the techniques of growing crystals in a floating area without the crucible has been stimulated. The key problem in the method of growing crystals in a floating area to produce crystals of high melting points is the selection of the heating source. Already reported are the electronic bundle, hollow cathode, xenon lamp or halide light focusing, electric arc plasma, flame, and the carbon dioxide gas laser to heat the melting area.

To assure good-quality crystal and to reduce the difficulties in the main heating source, some reports have noted the use of appropriate supplementary heating sources. At present, the diameter of the crystals with a high melting point is still limited (generally about 5 millimeters). This method of growing crystals is still being studied in the laboratory.

It is worth noting that a new method of growing crystals, which takes advantage of the upward induction method and the floating area method, is called the pedestal method (pedestal technique). This method uses an electronic bundle for heating a pedestal of multiple crystal rods of large diameter so that a melting area is produced on the tip of the pedestal. A single crystal is pulled in this melting area. Foreign nations have already used this method successfully to grow single crystals of silicon of superior quality without oxygen and carbon pollutants, and with an even electrical resistance and having a large dimension--40 millimeters in diameter x 900 millimeters in length.<sup>48</sup> If an appropriate heating source can be selected, it may be possible to use this method to study laser crystals with a high melting point.

3. The melted salt method was used at the end of the 1960's specifically for growing garnet crystals with large dimensions. A series of technological improvements have been reported. In recent years, there have been many reports on using this method to explore new optical crystals.

4. Although the method of temperature gradient and crucible reduction is a rather old method for growing crystals, it is still worth attention. Sulphur lanthium oxide crystals were first grown by this method. This method may possibly be used to grow large-diameter crystals. In 1971, a certain U.S. Army research center used this method to grow a single crystal of white gemstone of good optical quality, with a diameter of 150 millimeters x 68 millimeters and weighing 4.5 jin.<sup>49</sup>

Recent reports<sup>50</sup> indicate that this research center also used the temperature-reduction method successfully to study a single crystal without YAG impurities and having a diameter of 3 inches. It now is studying YAG injected with neodymium to provide ordinary weapon equipment with low-cost laser materials. The method is to use the temperature-reduction method to grow crystals with large diameters. These are then processed into many laser rods, and thus the cost is reduced. According to reports, the method used is to place the material in a molybdenum crucible with a cone-shaped bottom. This in turn is placed in the temperature-gradient furnace of the vacuum graphite heater. The content is heated to about 2100°C. The temperature reduction is carefully controlled. The growth rate is about 1.5 millimeters/hour. Preliminary experiments show that the growth of YAG injected with neodymium "is very hopeful."

5. In the use of the extension technique to grow laser crystals, there were reports during the mid-1960's that the gas-phase method was used for growing superior quality red rubies, but the growth rate was slow and it

is not appropriate for growing large crystals. As microlasers and integrated optics developed, the extension technique has also been given attention. Recently, foreign nations have used the liquid-phase extension technique to grow film lasers of yttrium aluminum garnet injected with neodymium and holmium on the underlining of YAG.

6. It has always been believed that growing crystals of dissimilar solid and liquid states was difficult. There have recently been some breakthroughs. Using the upward induction method, the crucible reduction method, and the floating area method to grow crystals of dissimilar solid and liquid states has solved the problem theoretically and in practice.<sup>51</sup>

The upward induction method of growing crystals of the same solid and liquid composition is conducted under conditions in which the boundary surface of growth is kept under constant conditions. To grow crystals of dissimilar composition of solid and liquid states (such as wrapped crystals), the temperature of the boundary surface of growth can be reduced according to the line separated out from the phase diagram of the growth material so that the growth material can maintain a stable liquid-phase pass saturation. Under a growth rate corresponding to the amount separated out, a single-wrapped crystal can be pulled from the liquid phase. Under the same principle, the crucible reduction method can also be used to grow crystals of dissimilar composition of solid and liquid states.

According to the reports,<sup>52</sup> based on the lever principle of the phase diagram, the floating area method can be used to grow crystals of dissimilar composition of solid and liquid states and can also be used to grow a solid solution that controls the composition and contains small amounts of injected impurities. In addition, the floating area method can be used to grow crystals with high melting points at low temperatures.

The establishment of these new methods of growing crystals will provide beneficial conditions for exploring new laser crystals.

#### IV. Conclusion

Summarizing the above, the outlook of the trends for development of the techniques of growing laser crystals can be generalized as follows:

1. Yttrium aluminum garnet is at present still the best laser crystal. It has already basically reached the mature stage. Many scientific and research units are not pouring any more efforts into research of this crystal. Some companies are already mass-producing it. The trend in the research of YAG at the prior stage is in the following: 1) The crystal's laser efficiency is being raised by injecting ions of double impurities, by supplementing the bulk, by expanding the dot matrix of the crystal lattice, and by sensitizing the impurities. Research in the multiple injection of impurities has a definite effect upon raising the efficiency

but may also bring about some unfavorable factors, such as reduction in thermoconductivity and enlargement of the line width. 2) Technological conditions of growing crystals are improved to raise the optical smoothness of the YAG crystal so that a continuous output of a higher power TEM<sub>00</sub> mode basic frequency (1.064 micrometers) and multiple frequency (converting to 0.53 micrometers via a second-order harmonic generator) is produced. This will provide a continuous multiple frequency single mode light source for application in holographic photography techniques.<sup>53</sup> 3) Studies are directed at growing large crystals or large dimensions (large diameter) to raise production and reduce cost. Efforts in this regard are not limited to the upward induction method but are also directed toward the exploration of using the temperature-gradient furnace in the temperature-reduction method to grow mixed YAG single crystals with large diameters.

2. Yttrium aluminate is at present the laser crystal receiving the most attention besides YAG. At the beginning it emerged as a great breakthrough, but difficulties in growth were encountered. (In the process of growth, twin crystals and splitting easily occurred.) These difficulties have now been solved. This crystal requires further in-depth study because of its unique properties due to its anisotropy. It is possible that in efforts to exploit its characteristics, the crystal will gradually replace YAG in certain application aspects.

3. Efforts to seek new materials are continuing actively, but up to now there have not been any great breakthroughs. The major goals of the search are mostly in the following four aspects:

1) High-gain laser crystals require that these materials have a large cross-sectional surface for jumps, high gain, a low threshold during continuous operation, and high efficiency. Those receiving relatively more attention are sulphur lanthium oxide, neodymium pentaphosphate, and gadolinium scandium aluminum garnet. At present they are all in the growth research stage.

2) Laser crystals with high storage capacity. They require that the materials have a long fluorescent life, the fluorescent line must be wide, there must be a high threshold value of resistance to damage by power of light, they must have high saturation power, and they must be suitable for operation requiring high-energy storage and be suitable for operation requiring high-power pulse and modulated Q. Silicate oxide limestone, mixed yttrium, gallium aluminum garnet, lithium yttrium fluoride, lanthium beryllium, and multiple crystalline ceramics are under study. These materials still cannot compare with neodymium glass.

3) Opening up new laser wave bands. With the development of nonlinear optics, repeated frequency amplification and parametric oscillation techniques will expand the range of laser wavelengths, and there may be

additional laser crystals with more wavelengths. Presently available basic materials are injected with other excited ions. The more frequently reported are  $Tb^{3+}$ ,  $Ho^{3+}$ ,  $Er^{3+}$  and  $Tm^{3+}$ . These excited ions operate mostly at low temperatures. Only a few crystals are suitable for room temperature operation, for example:  $LiYF_4:Gd^{3+}Tb^{3+}$  (0.5445 micrometers),  $LiYF_4:Er^{3+}$  (0.85 micrometers),  $Y_2O_3:Er^{3+}$  (0.851, 1.663 micrometers),  $Li(Y,Er)F_4:Tm^{3+}$ ,  $Ho^{3+}$  (2.0654 micrometers),  $Y_2O_3:Cr^{3+}Tm^{3+}$  (2.348 micrometers). The actual application of these new wavebands has already been developed gradually and has opened up a new future for the further expansion of solid lasers.

4) Crystals for special lasers such as microlasers and film lasers, laser crystals which can operate under high temperatures, and crystals with self-amplifying frequency such as lithium niobate crystals should be sought. As basic research becomes more profound, laser crystals with new properties and uses will emerge.

4. Recently, research and development of methods of growing crystals has been very active. This is because of the hope of further raising the quality, increasing the production, and reducing the cost of presently available crystals, and also because of the hope of providing more effective means of seeking new materials. The trends worth noting are as follows: 1) It is possible to use the temperature-reduction method in a temperature-gradient furnace to grow red gemstones with large diameters, YAP, YAG or make magnesia-alumina rock used in large-scale integrated circuits in mass production to greatly elevate the production and reduce the cost. 2) Breakthroughs may be possible in the use of relatively satisfactory heating methods (they must be accompanied by appropriate supplementary heating) such as the floating area method or the pedestal method to study laser crystals with a high melting point. 3) As integrated optics develops, a wave of enthusiasm may emerge in the study of the technique of extended optical film and in the growth of microlaser working materials.

For over 10 years, research activities in the techniques of growth of laser crystals abroad have been relatively active and development has been rather fast. We have followed the glorious teaching of Chairman Mao to "conscientiously study the good experiences of foreign nations, as well as the bad experiences of foreign nations--as a warning" and have collected and commented on some of the relevant foreign information as a reference for concerned comrades. Because of the low standard of our ideology and work, there must be many mistakes and inappropriate points. We welcome criticism and correction.

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9296

CSO: 4008

## PHYSICAL SCIENCES

### PRC SCIENTISTS TO PUBLISH PAPERS ON QINGHAI-TIBETAN PLATEAU

OW110724 Beijing XINHUA in English 0713 GMT 11 Aug 80

[Text] Xining, August 11 (Xinhua)--A collection of papers on the frozen earth of the Qinghai-Tibetan plateau will soon come off the press.

The papers are the results of 5 years of intensive study by 300 Chinese scientists of the youngest plateau in the world.

The scientists now understand better the formation, growth and structure of the plateau's frozen earth. This is the first comprehensive, systematic and multi-disciplinary study of the kind China has ever undertaken.

The scientists are members of a hydrogeological team in Qinghai Province, the Geodynamics Institute and the Institute of Hydrology of the Chinese Academy of Geological Science.

They studied periglacial phenomena and paleogeomagnetism of the quaternary ice age on the Qinghai-Tibetan plateau and the hydrology and engineering geology of the frozen earth and the utilization of modern glaciers.

The scientists discovered large areas of underground water, which provides a basis for industry on the plateau.

The frozen earth area covers 1.47 million square kilometers, accounting for 66.8 percent of the plateau's total area. The depth of the frozen earth ranges from 20.5 to 80 meters. The thickest layer is 128 meters below the surface.

CSO: 4020

PRC WORKER COMPILES GLOSSARY OF MINICOMPUTER TERMS

OW162058 Beijing XINHUA Domestic Service in Chinese 0122 GMT 16 Jul 80

[Text] Changsha, 16 Jul--The "English-Japanese-Chinese Glossary of Mini-computer Terms" to be published soon by the National Defense Publishing House is being compiled under the coordination of Zhou Jiwu, a grade 2 worker recommended and supported by a number of experts.

This reference book on electronic computers is being jointly compiled and translated by eight units including Qinghua University, Chongqing branch of the Information Institute of the Chinese Academy of Sciences [CAS], the CAS Computer Technology Institute and the Zhuzhou Municipal Institute of Electronics. In addition to coordination, Zhou Jiwu is responsible for the translation and compilation of sections A to D.

Zhou Jiwu, 32, is a technical information worker with the Zhuzhou Municipal Institute of Electronics, Hunan. He is fluent in English and can do basic translations in German and Japanese. After joining the Municipal Institute of Electronics in 1976 and after overcoming many difficulties, with the support of leading cadres, he inaugurated the information journal "Electronic Newsletter" for the institute's internal use. This journal carried over 400,000 words consisting of his translations from articles on advanced electronics abroad. The newsletter was enthusiastically received by the departments concerned. He also contributed many translated articles on electronic technology to Chinese science and technology publications. He has done a great deal of work in the field of technical information on electronics.

Zhou Jiwu acquired professional knowledge and the ability to understand and translate foreign languages purely through self-study. He graduated from senior middle school in 1966 and was sent to the countryside to become a peasant in 1968. He studied foreign languages and began translating English and American literary works in his spare time while a peasant. In 1972, he returned to Zhuzhou municipality because of illness. He was then a substitute teacher or piece worker. However, he never ceased his self-study. His ability was discovered by a leading cadre in the Zhuzhou Municipal CCP Committee in 1976 and he was recommended to the Zhuzhou Municipal Institute of Electronics where he became a grade 1 worker. After 1 year, he was promoted to grade 2. The Zhuzhou Municipal CCP Committee's departments concerned are considering giving him a proper technical title.

APPLIED SCIENCES

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Beijing GUOJI HANGKONG [INTERNATIONAL AVIATION] in Chinese No 4, Apr 80

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CSO: 4008

## LIFE SCIENCES

### RESULTS ON SURVEYS ON PSYCHOSIS REPORTED

#### Sichuan Province

Beijing ZHONGHUA SHENJING JINGSHENKE ZAZHI [CHINESE JOURNAL OF NEUROLOGY AND PSYCHIATRY] in Chinese No 1 Mar 80 pp 7-9

[Article by Liu Xiehe [0491 0588 0735], Huang Mingsheng [7806 2494 3932], Zhang Rongsong [1728 2837 2646], Zhang Yuping [1728 5940 1627], and Hu Guangcai [5170 0342 2088] of the Psychosis Research Laboratory of the Sichuan Medical College: "Survey of Psychosis in Sichuan"]

[Text] Between 1973 and 1975, we conducted an epidemiologic survey of psychosis in Zigong, Yibing, Leshan, Jianwei and Shuangliu areas in Sichuan to compile a reference for the work in preventing psychosis. The results of the survey are briefly reported in the following.

#### Method of Survey

Before the survey began, meetings were held with the unit leaders of residents or barefoot doctors to explain the significance, method, scope and demands of the survey, and to gain a preliminary understanding of the conditions of illness of psychotic victims among the local residents. A list of psychotic patients and suspected psychotics was compiled. Then trained psychiatrists were sent to the streets and the production teams to examine the patients. All patients determined without doubt to be psychotics, including those cured, those not cured, those who had died, of those who were missing, were registered by the doctors who filled out survey cards. During the survey, further propaganda was conducted among the masses so that they understood and sought out suspected victims of psychosis to supplement the list of unregistered patients. Then, double checking, correcting errors in diagnosis or checking those who were missed the first time were conducted during the course of treatment by mobile medical personnel. Annual population figures of the residents (1964 to 1973) were provided by the local basic units. The transient population was not included in the survey. The total population surveyed for this article was 349,797 persons.

## Results of Survey

### I. Number of Patients

1. Permanently ill: All patients, including patients who have been cured or current patients but not including those who have died or are missing, are listed statistically as numbers per thousand in Table 1. Among the surveyed 349,797 persons, schizophrenics numbered 1,806 cases. Of these, 140 have died and 1,666 remain. Permanent schizophrenics constitute 4.8 percent. Other psychotic number 433 cases. Of these, 31 are dead and 402 remain. Of these 1.1 percent are permanently ill. There are a total of 2,239 cases of psychosis, 171 are dead, 2,068 remain. Of these, 5.9 percent are permanently ill.

Table 1. Number of Patients of Permanent Psychosis

1 地点	7 时间	8 总人数		9 精神分裂症		10 其他精神病		11 总计	
		例数	%	例数	%	例数	%	例数	%
2 自贡	1973	106,268		582	5.3	205	1.9	787	7.2
3 乐山	1973	82,156		42	5.2	84	1.0	126	6.2
4 泸州	1973	99,060		455	4.6	78	0.8	533	5.4
5 简阳	1974	41,270		175	4.0	29	0.7	204	4.6
6 双流	1975	17,046		47	2.7	6	0.3	53	3.0
11 总计		349,797		1,668	4.8	402	1.1	2,068	5.9

#### Key:

- |                       |                                     |
|-----------------------|-------------------------------------|
| 1. Location of survey | 7. Time of survey                   |
| 2. Zigong             | 8. Total number of persons surveyed |
| 3. Leshan             | 9. Schizophrenia                    |
| 4. Luzhou             | 10. Other forms of psychosis        |
| 5. Jianwei            | 11. Total                           |
| 6. Shuangliu          | 12. Number of cases                 |

2. Current number of patients: Patients who have not been cured at the time of the survey are listed in numbers per thousand in Table 2. The current patients of schizophrenia constitute 3.1 percent, other patients of psychosis number 0.4 percent, totaling 3.5 percent.

3. Number of patients of all kinds of psychosis and percentages: As shown in Table 3, the number of schizophrenics is the highest, and they constitute the greatest percentage (80.7 percent). They are followed by contagious and reactive psychosis, constituting 4.2 percent and 3.8 percent respectively.

Table 2. Number of Current Patients of Psychosis

1 地点	8 时间	9 总人数	10		11		12		7 计
			12 例数	%	12 例数	%	12 例数	%	
2自贡	1973	106,265	376	3.5	74	0.7	450	4.2	
3乐山	1973	82,166	278	3.4	23	0.3	301	3.7	
4泸州	1973	99,560	281	2.8	34	0.3	315	3.2	
5犍为	1974	44,270	114	2.6	14	0.3	128	2.9	
6双溪	1975	17,546	21	1.2	3	0.2	24	1.4	
7 共 计		349,797	1,070	3.1	148	0.4	1,218	3.5	

Key:

- |                       |                                     |
|-----------------------|-------------------------------------|
| 1. Location of survey | 7. Total                            |
| 2. Zigong             | 8. Time of survey                   |
| 3. Leshan             | 9. Total number of persons surveyed |
| 4. Luzhou             | 10. Schizophrenia                   |
| 5. Jianwei            | 11. Other forms of psychosis        |
| 6. Shuangliu          | 12. Number of cases                 |

Table 3. Number of Cases and Percentages of Various Psychosis

	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	传染性 精神病	中毒性 精神病	脑外伤 精神病	脑充血 精神病	脑出血 精神病	脑肿瘤 精神病	其他 精神病	老年 精神病	老年 精神病	老年 精神病	老年 精神病	老年 精神病	老年 精神病	老年 精神病	老年 精神病	老年 精神病
1 例 数	94	32	20	17	45	19	21	6	88	3	17	8	31	84	1,806	2,239
2 患病率(%)	0.27	0.09	0.06	0.05	0.13	0.05	0.06	0.02	0.16	0.01	0.05	0.02	0.09	0.24	5.16	6.4
3 百分比(%)	4.2	1.4	0.9	0.8	2.0	0.8	0.9	0.3	1.6	0.1	0.8	0.4	1.4	3.8	80.7	100.0

Key:

- |  |  |
|--|--|
| 1. Number of cases   | 10. Psychosis due to other encephalon diseases |
| 2. Proportion of patients (percentage)                                       | 11. Early senile psychosis                     |
| 3. Percentage  | 12. Senile psychosis                           |
| 4. Contagious psychosis  | 13. Periodic psychosis                         |
| 5. Toxic psychosis   | 14. Symptomatic psychosis                      |
| 6. Psychosis due to outer brain damage                                       | 15. Menopause psychosis                        |
| 7. Psychological hindrance due to diseases of cerebral arteries              | 16. Manic depressive psychosis                 |
| 8. Epileptic psychological hindrance   | 17. Reactive psychosis                         |
| 9. Retarded psychological development accompanied by psychological hindrance | 18. Schizophrenia                              |
|  | 19. Total                                      |

4. Number of patients in cities and villages: Of the 201,814 persons surveyed in the towns, there are 1,132 cases of schizophrenia. They constitute 5.6 percent of the population. There are 217 cases of patients with other forms of psychosis, constituting 1.1 percent. The total number of patients is 6.7 percent. Of the 147,983 persons surveyed in the villages, there are 674 cases of schizophrenia, or 4.6 percent. There are 216 cases of patients with other forms of psychosis, or 1.5 percent. The total number of patients constitutes 6.1 percent of the population. The number of schizophrenics in the cities is higher than that in the farm villages ( $P < 0.01$ ). The number of patients with other forms of psychosis is higher in the farm villages than in the cities.

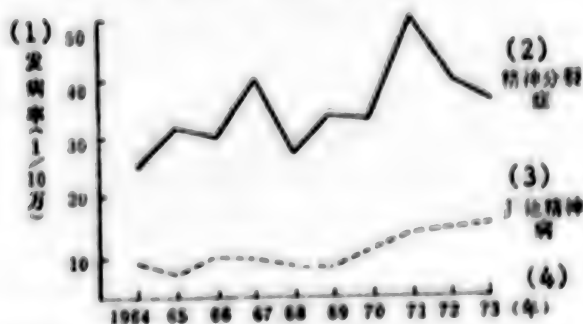
5. Number of male and female patients: Of the 174,312 males surveyed, there are 797 cases of schizophrenia, or 4.6 percent. There are 220 cases of other forms of psychosis, or 1.3 percent. They total 1,017 cases, or 5.9 percent. Of the 175,485 females surveyed, there are 1,009 cases of schizophrenia, or 5.7 percent. Patients with other forms of psychosis number 213 cases, or 1.2 percent. They total 1,222 cases, or 7 percent. The number of females suffering from schizophrenia is higher than that of males ( $P < 0.01$ ). The numbers of male and female patients of other forms of psychosis are about the same.

## II. Probability of Illness:

This is also called the number of incidences of illness or the expected number of incidence of illness. According to Weinberg's simplified formula, the probability of schizophrenia described in this article is calculated to be 12 percent.

## III. Number of Incidences of Illness:

This is a count of the number of new cases of illness for every 100,000 people each year. Between 1964 and 1973, the highest number of incidences of schizophrenia was 49, the lowest was 24, an average of 35. The highest number of incidences of other forms of psychosis was 14, the lowest was 4, an average of 9. The following diagram shows the change in the number of incidences of illness over a 10-year period.



Accompanying Diagram: Changes in the Incidences of Illnesses 1964-1973

Key: 1) incidence of disease (1/1,000,000) 3) Other forms of psychosis  
2) Schizophrenia 4) Year

#### IV. Survey of Family History

Table 4 shows that among the close relatives of schizophrenics and other patients of psychosis, those families that have a previous history of psychosis and epilepsy have more psychotics and schizophrenics than normal families. Further survey showed more fathers and mothers, brothers and sisters and sons and daughters of patients suffer from the same type of illness than those less closely related to the patient by blood. The information shows that genetic factors exert a definite effect upon the incidences of psychosis, especially of schizophrenia.

Table 4. Family History of Psychotics

	调查 总例数	5 有精神病 家族史		6 有癫痫 家族史		7 有精神病及 不全家族史	
		例数	%	例数	%	例数	%
1 精神分裂症	1,443	423	29.4*	29	2.0*	17	1.2
2 其他精神病	374	64	17.1*	20	5.3*	3	0.8
3 正常人	1,509	97	6.4	13	0.9	14	0.9

\* Determined by  $\chi^2$ , and compared to the normal group, there is visible difference

Key:

- |                                   |  |
|-----------------------------------|--|
| 1) Schizophrenics                 | 5) With a family history of psychosis                          |
| 2) Other psychotics               | 6) With a family history of epilepsy                           |
| 3) Normal persons                 | 7) With a family history of retarded psychological development |
| 4) Total number of cases surveyed | 8) Number of cases   |

#### V. Survey of the Cause of Illness:

Of the 2,239 schizophrenics, 1,797 have provided information on the cause of the illness. Of these, 939 (52.3 percent) have psychological factors as causes, and 62 (3.5 percent) have medical causes. The remaining 794 cases do not have any obvious causes.

The causes of the other forms of psychosis are different. There are 94 cases of contagious psychosis, nearly half suffered from high fever of unknown origin (46 cases), followed by malaria (20 cases) and contagion via the respiratory tract (11 cases). There are 21 cases of psychosis resulting from disease of the encephalon. Over half (11 cases) are the result of diseases inside the cranium (including meningitis, tuberculous meningitis, encephalitis). Therefore, active prevention of contagion has a definite significance in reducing the incidences of psychosis.

Toxic psychosis cases number 32, 17 caused by medication. Of these, seven were caused by tetrachloroethylene. There are eight cases of alcohol poisoning, of these, seven are due to acute alcohol poisoning. There are two cases of carbon monoxide poisoning, causing psychotic hindrances.

There are 17 cases of psychotic hindrance caused by diseases of the blood vessels in the brain. Of these, eight cases are caused by cerebral hemorrhage. There are seven cases caused by hardening of the cerebral arteries. One case is caused by thrombosis and one caused by embolica thrombosis.

There are 17 cases of symptomatic psychosis. Of these, seven are caused by such respiratory diseases as tuberculosis, chronic bronchitis and pulmonary heart diseases.

Reactive psychosis cases number 84. The cases of the disease are closely related to psychological factors. Some of the cases are related to the death of a close relative, criticism, arguments, and frightening experiences. There are only two cases caused by marital troubles.

#### VI. Present Age:

Table 5 shows that at the time of the survey, 74 percent of the schizophrenics were between the ages of 15 and 49. Those under 14 years old constituted 2 percent. Those 50 years or older numbered 24 percent. The youngest patient was 9 years old and the oldest was 88 years old. Distribution of the age of patients with other forms of psychosis was not regular, because the ages of patients differed according to the different kinds of diseases. The youngest was 5 years old (epileptic psychosis hindrance). The oldest was 90 years old (old age psychosis).

Table 5. Ages of Psychotic Patients (Years Old)

		0~	5~	10~	15~	20~	25~	30~	35~	40~	45~	50~	55~	60~	65~	70~	80~	90~	4
1	11.4%	3	6	15	75	118	135	115	116	131	110	70	77	42	40	24	108		
	52.2%	0	0.6	1.4	7.0	12.0	17.6	10.8	10.9	9.5	11.2	6.6	7.7	4.9	3.7	2.6	10.0		
2	11.4%	3	6	7	11	16	5	6	2	10	20	7	9	10	6	32	118		
	1.46%	0.7	4.1	4.7	7.4	11.8	3.4	4.1	1.4	6.7	13.3	4.7	6.1	5.7	4.1	21.6	100.0		

Key:

1) Schizophrenics

2) Other forms of psychosis

3) Number of cases

4) Total

## VII. Age When Illness Began

Table 6 shows the number of patients of schizophrenia visibly increases between 10 and 14 years old. The number reaches a peak between ages 15 and 24 and then gradually drops. The greater number of patients of other forms of psychosis also reaches a maximum between the ages of 15 and 24.

Table 6. Ages of Incidences of Psychosis (Years Old)

		0~	5~	10~	15~	20~	25~	30~	35~	40~	45~	50~	55~	60~	65~	>70	4 总计
1 精神分裂症	3 例数	4	25	148	347	376	240	192	146	114	79	52	41	27	13	6	1,770
	%	0.2	2.0	8.4	19.6	18.4	13.6	10.8	8.3	6.5	4.5	2.9	2.3	1.5	0.7	0.3	100.0
2 其他精神病	3 例数	21	31	34	67	62	30	30	20	25	28	16	11	16	13	22	426
	%	4.9	7.3	8.0	16.7	14.6	7.0	7.0	4.7	5.9	6.6	3.7	2.6	3.7	3.1	5.2	100.0

Key:

- 1) Schizophrenics
- 2) Other forms of psychosis
- 3) Number of cases
- 4) Total

## VIII. Course of Illness

Table 7 shows schizophrenics with a history of the illness of less than half a year number only 11.4 percent. Those with a history of the illness of 2 years or less number 27 percent. Most patients (73 percent) have a history of the illness for more than 2 years. The number of patients with a history of the illness of over 10 years is 29.8 percent. There were 11.6 percent who have had the illness for over 20 years. The course of illness of other forms of psychosis varies according to the types of illness. Because contagious and reactive psychosis constitute relatively high percentages, the histories of these two diseases are generally relatively short. Over one half (53.7 percent) of the cases of this large category of illness has a history of less than half a year, and at the time of the survey, most have already been cured.

Table 7. Duration of Psychosis (Year)

		0~	0.5~	1~	3~	6~	11~	16~	>20	4 总计	5 其他
1 精神分裂症	3 例数	205	117	164	356	397	199	130	210	28	1,806
	%	11.4	6.5	9.1	19.7	22.0	11.0	7.2	11.6	1.5	100.0
2 其他精神病	3 例数	232	19	37	46	39	13	11	10	25	432
	%	53.7	4.4	8.6	10.7	9.0	3.0	2.6	2.3	5.8	100.0

Key:

- 1) Schizophrenia
- 2) Other forms of psychosis
- 3) Number of cases
- 4) Unknown
- 5) Total

## IX. Present Situation:

The criteria for judgment: (1) Cured: Psychotic symptoms have completely disappeared. There are no after effects or personality damages. The ability to work and to learn has been returned to the level prior to the illness. There is sufficient self-consciousness and there is no need for medical attention. (2) Gradual resolution: The symptoms of psychosis have basically disappeared, but the condition is still unstable. There are still hindrances to neurofunctions or personality changes. The ability to work and to learn has not completely returned to the level prior to the illness. There is some self-consciousness, but continued medication is needed to sustain the improved conditions. (3) Not cured: The symptoms are still obvious. (4) Died or missing: At the time of the survey, the patient has already died or has been missing for over 1 year and his whereabouts is unknown.

Of the 1,806 schizophrenics, 280 were cured (15.5 percent) and 316 were gradually resolved (17.5 percent), totaling 33 percent. Those not yet cured numbered 1,070 cases (59.2 percent). Deaths or missing number 140 or 7.8 percent (of these 9 were missing). Of the other 433 cases of other forms of psychosis, 226 were cured (52.2 percent). This was because about 40 percent of this group was reactive and contagious psychosis which later improved. There were 28 cases that were gradually resolved (6.5 percent), mainly of epileptic psychosis hindrance and manic depressive psychosis. The condition of the illness has not stabilized and there is the possibility of recurrence. There were 148 cases which were not cured (34.2 percent), mostly of psychotic hindrance in the encephalon. There were 31 cases of death of schizophrenics, mostly due to illness and suicide (each numbered 23 cases). Some of the deaths were due to accidental causes. Most of the patients of other forms of psychosis died of illness.

## X. Conditions of Treatment:

Of the 1,806 schizophrenic cases, 1,383 received systematic or nonsystematic treatment (76.6 percent). There were 423 cases that did not receive treatment (23.4 percent). Of those treated, only 395 received systematic treatment (21.8 percent). Of the 423 cases that did not receive any treatment, 72 recovered and were gradually resolved. The rate of gradual self-resolution was 17 percent.

Patients with other forms of psychosis who received treatment numbered 288 (66.5 percent). The number of untreated was 145 (33.5 percent).

In 395 cases of schizophrenia, the patients received systematic treatment and were ordered by the doctor to take long-term medication or to

remain in the hospital. Those cured or cases of gradual resolution numbered 168 (42.5 percent). Those who were not cured and who died numbered 227 (57.5 percent). Of the 1,411 cases that were not subjected to systematic treatment, those cured and those of gradual resolution numbered 443 (31.4 percent), those that were not cured and those that died numbered 968 (68.6 percent). Comparing the 2 groups shows that the number cured or of gradual resolution is higher among patients who received systematic treatment ( $\chi^2 = 17.12$ ,  $P < 0.01$ ), indicating systematic treatment exerts a definite effect upon the cure and gradual resolution of this disease.

#### XI. The Effect of the Disease Upon the Labor Force

Of the 1,660 adult schizophrenics, 623 (37.5 percent) were able to work after their illness. Some 615 were able to retain partial labor ability (37 percent). There were 422 (25.4 percent) who lost their labor ability after their illness. Patients who have not been cured of the other forms of psychosis also were unable to perform their original work because their labor ability was affected.

#### XII. Effect of the Patients Upon Society:

Of the 1,806 cases of schizophrenia, 169 constituted a danger to social order (9.4 percent); 21 endangered production (1.2 percent); and 26 exerted bad political influence (1.4 percent). The 3 kinds totaled 216 cases (12 percent). Of the 433 patients with other forms of psychosis, 13 endangered social order (3 percent), 4 endangered production (0.9 percent), totaling 17 cases (3.9 percent). In addition, some patients destroyed objects and inflicted harm upon themselves.

#### Hunan Province

Beijing ZHONGHUA SHENJING JINGSHENKE ZAZHI [CHINESE JOURNAL OF NEUROLOGY AND PSYCHIATRY] in Chinese No 1 Mar 80 pp 15-18

[Article by Yang Desen [2799 1795 2773] and Chen Yongde [7115 3257 1795] of the Neurological Department of Hunan Medical College; Tang Zhipan [3282 0037 4149] and Liu Hanxing [0491 3352 5281] of the Hunan Psychiatric Hospital: "A Survey Report on Psychosis in Hunan Province"]

[Text] In 1958, the Hunan Provincial Public Health Department sponsored, with the help of the Province's Public Security Department and the Civil Affairs Department, a survey of psychosis in Hunan Province. Our psychosis survey unit conducted a general survey of psychosis among city and village dwellers from February 1958 to February 1959. The survey covered 30 people's communes, 30 medium and small county towns and 2 large cities of Changsha and Hengyang. The number of residents surveyed totaled 1,424,751. At the time, the residents' organization in the cities was

well organized. The farm village production organization was at the peak of collectivization. Our work received enthusiastic support from the broad masses of the basic level cadres, and the work proceeded smoothly. In 1959, based on the survey results, a psychiatric hospital was established in each prefecture. Today, we publish this historical information to confirm the achievements in our nation's field of psychiatry and to provide a comparison for the future.

#### 1. Survey of the Number of Patients

A survey was conducted in 30 communes in Changsha County. Workers went to the production teams (10 to 30 families, over 100 people). The cadres of the teams and surrounding commune members provided leads for the workers to visit the families to check on patients. The survey covered a total of 463,811 persons. A total of 587 current cases, or 1.27 percent, were found (not including all patients whose illness has gradually been resolved, and manic depressive cases that have been gradually resolved); this did include patients with obvious symptoms (not including marginal cases) and seriously ill (not including those suffering from retarded psychological development, sick personality, neuropathy). They are listed in Table 1 under separate diagnostic classifications.

Table 1. Number of Psychotics in the Farm Villages of Changsha County

	Number of Cases	Proportion of Population (Percent)
Schizophrenia	356	.77
Purpose psychosis	68	.15
Senile psychosis	41	.09
Early depressive psychosis	20	.04
Manic depressive psychosis	29	.06
Infectious and toxic psychosis	4	.01
Reactive psychosis	17	.04
Others	13	.03
Undiagnosed	39	.08
Total	587	1.27

In the 30 communes, the highest number of serious psychotics was found at the Daxing Commune, constituting 2 percent, and the lowest was 0.87 percent, found in Langli Commune. Later, we took 20 days to conduct a recheck of Langli Commune, using the lists of the production teams for role call inquiries and a door-to-door survey. In addition to the original 17 cases listed, we discovered 5 cases of serious psychosis not included the first time. The corrected number of cases, after re-checking, was 1.09 percent. During the course of the door-to-door visits, we surveyed and registered 13 cases of serious psychosis that have gradually

resolved. Of these, four cases have been gradually resolved over 9 years. A diagnostic review of these cases that have already been resolved showed there were three cases of manic depressive psychosis, three of schizophrenia, and three of undiagnosed psychosis. Including all cases which have been gradually resolved, cases of serious psychosis in the Langli Commune totaled 1.73 percent. Of these 0.79 percent were of schizophrenia and 0.3 percent were of manic depressive psychosis. The number of schizophrenics was 2.6 times that of manic depressive psychotics.

At the same time, Langli Commune also conducted a survey to register cases of retarded psychological development (serious and intermediate) epilepsy and hysteria. Among the population of 20,223, there were 127 cases of serious psychosis, visibly retarded psychological development, epilepsy and hysteria, or 6.28 percent.

In Changsha and Hengyang, the survey of residents covered 469,178 people (not including collectives, residents living on riverboats, railway workers). Serious and current psychotic patients numbered 680 cases, or 1.47 percent. They are listed in Table 2 under diagnostic classifications.

Table 2. Number of Psychotic Patients Among Street Residents of Changsha and Hengyang Cities

	Number of Cases	Proportion of Population (Percent)
Schizophrenia	396	.84
Purpose psychosis	82	.17
Senile psychosis	29	.06
Early senile psychosis	37	.08
Manic depressive psychosis	22	.05
Infectious and toxic psychosis	34	.07
Reactive psychosis	20	.04
Others	28	.06
Undiagnosed	41	.09
Total	689	1.46

## II. Comparison of the Survey Data With Clinical Records and Records of Hospitalized Psychotic Patients:

We discovered in the survey among city and village residents a total of 1,752 cases of serious psychosis. Between 1947 and 1959, the Hunan Medical College had a total of 1,265 serious psychotic patients who were hospitalized. The college's outpatient clinic received and handled 1,269 cases of serious psychotic patients between the end of 1958 and the end of 1959. These are analyzed by category as follows:

1. Comparison of diagnostic classification: Several problems can be seen from Table 3. (1) Among all the data, the number of schizophrenics was the highest, always totaling about 60 percent. (2) Senile psychosis was also high among the cases surveyed, but it was infrequently seen among the outpatients or hospitalized cases. (3) Reactive psychosis constitutes a very high proportion among the outpatient cases because some acute schizophrenic cases were mistakenly diagnosed as reactive psychosis. In the general survey, 85 percent of all schizophrenics seen had suffered from the illness for over 2 years, and the possibility of mistakenly diagnosing these as reactive psychosis was small. (4) There were more cases of contagious toxic psychosis that were hospitalized, but few were discovered in the general survey. In addition, there were few syphilitic psychosis cases. This was because of a lack of various laboratory test information, and diagnosis was relatively difficult and there would have been some cases which were not included. (5) The general survey found more paranoid psychotic cases (mostly psychological paranoid psychotics) than those either registered at the outpatient clinics or hospitalized. This was because these patients denied they were sick and firmly refused to seek medical attention. Actually, the number of cases is higher than the number realized by the hospital. (6) Cases of manic depressive psychosis were far fewer than schizophrenics in the Hunan region. Those hospitalized constituted less than one-tenth. Survey of Langli village showed a ratio of 1/2.7.

Table 3. Statistics of Diagnostic Classification of Patients of the General Survey, Outpatient Clinics and Hospitalized

										其他		
										14)	15)	16)
5)	6)	7)	8)	9)	10)	11)	12)	13)	14)	15)	16)	
100.0	61	85	81	86	32	22	21	87	118	100.0		
4) 48.6	3.5	1.9	4.6	2.9	1.4	1.8	1.3	12.2	2.1	6.7	100.0	
2) 77.1	27	4	40	270	27	46	54	22	8	1,269		
4) 60.8	2.1	0.3	3.2	21.3	2.1	3.6	4.3	1.7	0.6	100.0		
3) 819	80	1	45	130	70	49	14	41	16	0	1,265	
4) 64.7	6.3	0.1	3.6	10.3	5.5	3.9	1.1	3.2	1.3	0	100.0	

\* Paranoid psychosis includes paranoid psychosis, paranoid dementia, psychological paranoid psychosis and purpose psychosis of unknown cause

Key:

- |                               |                                    |
|-------------------------------|------------------------------------|
| 1. General survey             | 9. Reactive psychosis              |
| 2. Outpatient clinics         | 10. Infectious and toxic psychosis |
| 3. Hospitalized               | 11. Syphilitic psychosis           |
| 4. Number of cases            | 12. Epileptic psychosis            |
| 5. Schizophrenia              | 13. Paranoid psychosis             |
| 6. Manic depressive psychosis | 14. Other organic psychosis        |
| 7. Senile psychosis           | 15. Undetermined                   |
| 8. Early senile psychosis     | 16. Total                          |
|                               | 17. Unclassified                   |

2. Incidences of illness of the different sexes: Table 4 shows several problems revealed by a comparison of the data of the three types: (1) The number of males hospitalized was double that of females. This was mainly due to the unequal opportunities of men and women to seek medical help. This was because prior to 1958, our hospital's beds for males and females were not set. In 1958 when the hospital moved, the number of beds for male patients increased onefold. (2) In the survey, the number of female patients far outnumbered males. According to a door-to-door survey of one village, it was found that the five cases that were missed in the original survey were all females. This kind of difference was obviously not caused by excluding the male patients. Unequal opportunities for treatment, i.e., lesser opportunities for females to receive treatment may have had a certain effect, but those treated by our hospital's outpatient clinic or hospitalized constituted only 6.6 percent of the surveyed cases in the farm villages, and only 16.6 percent of all cases found in the medium and small cities and towns, and only 35 percent of those cases in Changsha and Shenyang cities, a total of only 20 percent. Therefore, this phenomenon cannot be fully explained. It might have been possible that there is a remarkable difference in the number of patients of different sexes in the Hunan region. (3) If the general survey data are taken as the major data, and if one referred to the data of the outpatient clinic and hospitalized cases to see the difference between the sexes in each type of illness, one can discover that the majority of patients suffering from first-stage senile psychosis, manic depressive psychosis, paranoid psychosis and senile psychosis was female, while syphilitic psychosis patients were predominantly males.

Table 4. Distribution of Psychotics Surveyed, of the Outpatient Clinics and Hospitalized by Sex

		6)	7)	8)	9)	10)	11)	12)	13)	14)	15)	16)	17)
		分裂症	躁狂症	老年性	老年前期	反应性	感染性	梅毒性	癫痫性	妄想性	其他	未定	共 计
1) 普 查	男 4)	427	18	35	21	16	9	26	9	41	19	42	663
	女 5)	600	43	50	60	35	16	6	13	172	18*	76	1,089
2) 门 诊	男 4)	427	15	1	7	131	14	39	7	31	14	4	681
	女 5)	344	12	3	33	139	13	7	7	23	8	4	586
3) 住 院	男 4)	562	40	1	23	74	49	45	13	27	14	0	848
	女 5)	257	40	0	22	56	21	4	1	14	2	0	417

\*Including 7 cases of puerperal psychosis

Key:

1. General survey
2. Outpatient clinic
3. Hospitalized
4. Male
5. Female
6. Schizophrenia
7. Manic depressive psychosis
8. Senile psychosis

9. Early senile psychosis
10. Reactive psychosis
11. Infectious psychosis
12. Syphilitic psychosis
13. Epileptic psychosis
14. Paranoid psychosis
15. Other organic psychosis
16. Undetermined
17. Total

3. Statistics of the ages of seriously psychotic patients: The general survey and the hospitalization data differed greatly. Table 5 shows several problems: (1) Half of the hospitalized patients are in the 20-year old group. Young patients between 20 and 39 years old constituted over 70 percent. This was not due to a higher number of young patients but because they had more opportunities for treatment. (2) In the general survey, patients over 40 years old constituted 55.5 percent. Most were chronic patients who were stricken when they were young. A few were new cases within that age group.

Table 5. Current Age (Years Old) of Surveyed and Hospitalized Patients

Age Group (years old)	Hospitalized		Surveyed	
	Number of Cases	Percent	Number of Cases	Percent
0 - 9	2	0.1	4	0.2
10 - 19	200	15.8	58	3.3
20 - 29	621	49.1	295	16.8
30 - 39	279	22.1	423	24.2
40 - 49	119	9.4	415	23.7
50 - 59	38	3.0	282	16.1
60 - 69	6	0.5	182	10.4
70 - 79			93	5.3
Totals	1,265	100.0	1,752	100.0

The general survey proved that the number of all serious psychotic cases increased among higher age groups. The number of patients among children was the lowest and the number of patients among the old was the highest. This was because new cases were found in each age group and chronic cases accumulate year after year. If the number of cases in the 10 to 19 year-old age group is taken as 1, then Table 6 shows the indices of the proportion of cases among other age groups.

Table 6. Comparison of the Number of Patients with Serious Psychosis Among Residents of Different Ages (Years Old)

	0-9	10-19	20-29	30-39	40-49	50-59	60-69	70+
Changsha and Hengyang cities	.06	1	3.5	8.7	9.8	9.7	12.5	13.7
Farm villages of Changsha County	.05	1	8.1	12.6	15.1	12.9	12.8	20.4

### III. Comparison of the Distribution of Psychosis in our Nation and in Foreign Nations:

The distribution of psychosis in our nation's several large cities has been reported statistically.<sup>1,2</sup> Compared to statistics of foreign nations, it can be seen that there are some differences. Analysis and discussion in these regards are very significant in understanding the characteristics of distribution of psychosis in our nation.

1. In our nation, there are fewer cases of chronic alcoholic psychosis, drug withdrawal, syphilitic psychosis and psychosis due to hardening of cerebral arteries than in Europe and America. Dayton<sup>3</sup> compiled statistics for the state of Massachusetts and noted that among the 54,524 cases of serious psychotic patients admitted for the first time to all the mental institutions between 1917 and 1933, 23.5 percent were schizophrenics, the highest percentage; psychotic cases due to hardening of the arteries constituted 13.7 percent, the second highest; manic depressive psychotics constituted 11.7 percent, the third highest; psychotic cases due to alcoholism constituted 9.8 percent, the fourth highest. These were followed by senile psychotics which registered 8.8 percent, and paralytic dementia constituted 7.3 percent. Tietze<sup>4</sup> compiled statistics for the state of New York for 1940 which showed that among the 28,671 serious psychotic cases first admitted into mental institutions there, schizophrenics constituted 26.4 percent, the highest percentage, psychotic cases due to hardening of the arteries reached 20.1 percent, the second highest; senile psychotics constituted 11.2 percent, the third highest; manic depressive psychotic cases constituted 8 percent, the fourth highest; cases of psychosis due to alcoholism numbered 7.4 percent, the fifth highest. In these cases, the number of patients suffering from alcoholism, drug withdrawal and depressive psychosis continued to increase and their percentages have reached the highest. This situation is entirely different from that in our nation. They blame the malady on national and cultural differences. It seems that the fundamental reason may be the difference in social systems.

2. The percentage of schizophrenics in our nation's serious cases of psychosis, according to data of the general survey and hospitalization, was between 50 and 60 percent.<sup>1,2,7,8</sup> Dayton<sup>3</sup> showed 23.5 percent and Tietze<sup>4</sup> showed 26.4 percent for the United States. Tamura Sachio et al quoted Neitzsche<sup>5</sup> and reported that in Germany in 1934-1936, schizophrenics constituted one-third of all the patients in mental institutions throughout the nation. In Japan, they constituted between one-fifth and three-fifths. Keruikov<sup>6</sup> quoted statistics for France showing schizophrenics constituted one-fourth. In Canada, England and Germany, statistics showed one-third to one-half were schizophrenics. In the Soviet Union, one-third of those newly admitted to mental institutions were schizophrenics and two-thirds in the institutions were chronic schizophrenics. The numbers in our nation, when compared to foreign nations,

generally speaking, showed a higher number of schizophrenics. The reasons for the difference is multifaceted. First of all, the number of patients suffering from senile psychosis, psychosis due to hardening of the arteries, psychosis due to chronic alcoholism and drug withdrawal is extremely low. Therefore, the number of schizophrenic patients becomes higher in proportion. Secondly, most hospitalized patients in our nation are young people at the peak of schizophrenic outbreak. Of the more than 50,000 cases admitted to the hospital for the first time surveyed by Dayton,<sup>3</sup> 58 percent were over 40 years old. The difference in the ages of patients hospitalized also caused proportional changes in diagnostic classification.

3. The number of incidences of psychosis increases with age. More females suffer from manic depressive psychosis, menopause, senile and paranoid psychosis. An absolute majority of paralytic dementia patients was males. The same results were found in foreign nations.<sup>3,4</sup> The proportion of manic depressive psychosis and schizophrenia in the United States and Germany was one-half to one-third,<sup>7-5</sup> in Japan and Norway it was one-sixth,<sup>5,6</sup> in our province's farm village survey it was 1/2.6, and among our hospitalized cases it was one-tenth.

#### IV. Statistical Information on Several Frequently Seen Psychosis

In the general survey we registered over 1,000 schizophrenics, over 80 senile psychosis. The general survey and hospital statistics registered a total of 115 manic depressive psychotics. These are briefly analyzed as follows:

1. The survey of 1,027 schizophrenics showed the largest number started between the ages of 20 and 24, as shown in Table 7. But compared to the number of people in each age group among the normal population in the surveyed regions, it was discovered that the numbers in new cases among the 20 to 35 age group are not visibly different.

Table 7. Statistics of the ages (Years Old) of Initial Occurrence of Schizophrenia

	0-9	10-14	15-19	20-24	25-29	30-34	35-39	40+	Unknown	Total
Number of Cases	6	31	171	234	217	212	111	42	3	1027
Percent	.6	3.0	16.7	22.8	21.1	20.6	10.8	4.1	.3	100.0

Duration of illness: There were 161 cases (15.7 percent) who had suffered the illness for less than 2 years. There were 382 cases (37.2 percent) who had suffered the disease for less than 5 years. There were 261 cases (25.4 percent) who suffered the disease for 5 to 10 years. There were 179 cases (17.4 percent) who suffered the illness for 10 to 15 years. There were 64 cases (6.2 percent) who suffered the illness for 15 to 20 years and there were 141 cases (13.7 percent) who suffered the illness for over 20 years.

## Family History:

Of the total number of cases of psychosis, 21.5 percent of the patients had a family history of serious psychosis over 3 generations. There were 2,000 cases in Shanghai and 1,600 cases in Nanjing,<sup>7,8</sup> both constituting 22.2 percent.

2. The general survey registered 61 cases of manic depressive psychosis. There were also 54 cases diagnosed as suspected manic depressive psychotics which were hospitalized over past years and which have shown classic symptoms. The 2 totaled 115 cases. Of these, 60 cases occurred twice. In 13 cases, alternation of 2 phases occurred in mixed fashion. The types of illness and the age of first incidence of these 115 cases are shown in Table 8.

Table 8. Statistics of the Ages (Years Old) of Initial Occurrence of Manic Depressive Psychosis

Age Group (years old)	0-9	10-19	20-29	30-39	40-49	50-59	60+	Un- known	Total
Manic psychosis	1	13	31	18	9	0	1	1	74
Depressive psychosis	0	0	8	8	9	2	1	0	28
Manic depressive psychosis	0	1	5	3	3	1	0	0	13
Total	1	14	44	29	21	3	2	1	115

Table 8 shows the age of first incidence of the illness of the 115 cases. It can be seen that the peak number of cases of manic depressive psychosis was in the 20-year old age group. This coincides completely with the statistical data obtained by Xu Taoyuan [1776 7290 0955] et al.<sup>10</sup> and Yu Qinghan [0060 3237 3352] et al.<sup>15</sup> The number of first incidence of illness between the ages of 30 and 39 was second. The number of first incidence of the illness among those 10 years old or younger and 50 years or older was few. The number of manic psychosis between the ages 20 and 29 was the highest. There were very few depressive psychotic cases. The numbers of cases of first incidence of illness between ages 20 and 49 were close, and there was no peak. There were no cases of first incidence of illness before the age of 20. Among the surveyed and hospitalized cases, there were more cases of manic psychosis than depressive psychosis. The reason is that the former is easily discovered but the latter is easily overlooked. Among the cases in which the disease occurred twice, alternations of two phases occurred in mixed fashion in one-fifth. The maximum number of occurrences was 13 times.

Of the patients surveyed, 22.3 percent had a family history of the disease, 21.3 percent had an unknown family history. Of the hospitalized patients, 21.7 percent had a family history of the disease and 37 percent had an unknown family history.

3. Senile psychosis: There has not been any statistical information on this disease in our nation. Old patients frequently suffer from accompanying hardening of the cerebral arteries. There is difficulty in differentiating this disease from psychosis due to the hardening of the cerebral arteries. The survey can only depend upon the old age of first incidence of the illness and differentiate it from accompanying neurological symptoms and bodily symptoms, hardening of the radial artery, and cardiovascular diseases.

The current age and the age of first incidence of illness of the 85 cases of senile psychosis are shown in Table 9. Although the number of cases of the age group of 60 years and older are close, the normal population of old people drops off sharply as ages advance, the number of cases of illness rises as the age increases.

Table 9. Present Age and Age of Initial Occurrence of Senile Psychosis

	Present Age			Age of Occurrence		
	Male	Female	Subtotal	Male	Female	Subtotal
55-59	0	1	1	2	1	3
60-64	4	3	7	7	9	16
65-69	7	9	16	8	9	17
70-74	7	8	15	6	12	18
75-79	8	16	24	6	11	17
80 +	9	13	22	6	8	14
Totals	35	50	85	35	50	85

The course of senile psychosis is not long. There were 60 cases with a history of illness of 5 years, constituting 70.6 percent. There were 15 cases of illness lasting between 5 and 10 years, and 10 cases of illness lasting over 10 years. Of the total, three-fourths began gradually.

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DEVELOPMENT OF MEDICAL PSYCHOLOGY OVER THIRTY YEARS DISCUSSED

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demy of Sciences: "Thirty Years of Medical Psychology"]

[Text] Abstract

This article is a brief description of medical psychology over the past 30 years and a review of the research in psychotherapy, the psychological causes and psychological characteristics of neurosis, pathological and psychological characteristics of psychosis, psychological problems in acupuncture anesthesia, and psychological diagnosis of intellectually deficient children.

Medical psychology, like other branches of the science of psychology, developed over a rough path during the past 30 years. From 1949 when the entire nation was liberated to 1965, the eve of the Cultural Revolution, psychological workers established an ideology guided by Marxism through ideological reform of intellectuals, and systematically learned Pavlov's theories and established a laboratory to study the physiological mechanism of psychological activity with the method of conditioned reflex. In 1958, under the encouragement and prompted by the general line of the party, workers of medical psychology and other psychological workers walked out of the laboratory to better serve medical science and cooperated with concerned units of the medical sciences. They started to provide rapid comprehensive treatment mainly in using psychotherapy to treat patients suffering from neurasthenia first among students, and then among steel and iron workers and office cadres. They achieved more outstanding results than before. Later they provided similar treatment of some psycho-physiological diseases (hypertension, ulcer) and schizophrenia. Success was similarly achieved. These have induced the medical profession to pay attention to medical psychology. After the Cultural Revolution began in 1966, psychology was seriously attacked and destroyed by the counterrevolutionary and scheming group of Lin Biao and the "gang of four." Research work

in medical psychology was forced to cease. It was not until 1973 when the psychology institute was rebuilt that workers of medical psychology returned to the rank and file and prepared for the building of a physiological and psychological laboratory, cooperated with concerned units that provided medical treatment, and linked their work with the very important scientific research topic of the medical sciences--the study of the psychological problems in acupuncture anesthesia. In 1976, after the "gang of four" was devastated, work in medical psychology mushroomed throughout all regions of the nation and was launched one after the other. In December 1978, the second annual scholastic conference of the Chinese Psychology Society was held and in June 1979, a panel discussion in medical psychology was held in Beijing. They signified that medical psychology has entered into a new stage of development. The meetings decided to establish a staff committee in medical psychology. It will better push forward the development of our nation's medical psychology and contribute towards the great goal of the four modernizations!

The research work in the following major aspects are briefly described:

#### I. Study in Psychotherapy

Since Liberation, our nation has conducted relatively voluminous and systematic research in psychotherapy. In 1953, collective and individual psychotherapy was conducted to treat diseases of psychological causes--neurasthenia--and a definite achievement was made<sup>(1)</sup>. In 1958, the psychology institute cooperated with concerned units in the medical circles and treated patients suffering from neurasthenia using the comprehensive and rapid method of treatment based on the principles of psychotherapy first among students of Beijing University, and then among steel and iron workers. The subjects of treatment did not leave their daily work or daily learning. They participated for 4 weeks. Those that recovered or showed visible improvements reached 80 percent effectively treated, visibly higher than the results of past treatment<sup>(2-4)</sup>. Afterwards, many units throughout the nation propagated this method of treatment and achieved similar percentages of effective treatment<sup>(5,6)</sup>. In 1959, comprehensive and rapid treatment was also provided for patients having hypertension and ulcers. Similar visible results were obtained in a short period, the blood pressure of patients dropped and stabilized, and the ulcers in the intestine and stomach disappeared<sup>(7)</sup>. In 1961, the study of comprehensive treatment was conducted for schizophrenics. The percentage of cures resulting from the treatment (64.1 percent) was higher than the contrast treatment without psychotherapy (37.4 percent). The study of psychotherapy in comprehensive treatment is described below:

##### 1. The Characteristics and the Effectiveness of Treatment of Psychotherapy in Comprehensive Treatment

Comprehensive treatment contains three parts: (1) collective and individual psychotherapy, (2) medicinal and physical therapy, (3) activity therapy to

adjust mechanical and bodily functions such as chi gong and tai ji quan. In treating neurasthenia in the past, emphasis was placed only on the first part, or only on the second or third parts. No attempt was made to combine them organically like the comprehensive and rapid treatment method. Special emphasis was also placed on changing the patient's psychological state in group psychotherapy. The characteristic of this psychotherapy in comprehensive treatment is to change the mistaken recognition the patient has regarding the cause of the disease or various bodily changes due to diseases so that the patient's subjective mobility can be fully developed(8,9). The patient is allowed to recognize the patterns of the cause and the development of the disease and to establish a correct understanding of the disease, and thus eliminate the corresponding passive emotions, and correctly treat the conflict between the host body and the guest body, grasp the concrete method of self treatment, create a healthy atmosphere and environment to prevent mental over excitement and recurrence of hindrance to various motor functions, and reshape the original activity and behavior, establish a pattern suited to one's own mental activity and rhythmic activity and behavior.

The purpose of this psychotherapy is to fully develop the patient's subjective mobility in fighting the disease(10-13). During treatment, the manifestations of recognition, conscious activity and emotion were taken as the psychological indicators of the degree of development of the patient's subjective mobility (11). The degree of development of subjective mobility can also indicate the degree of acceptance of psychotherapy. Some people have reported that those patients who have showed a better development of subjective mobility were also those who were more effectively treated(10,11). Some other reports also indicated that among the patients of neurasthenia being treated with entirely the same medication and physical therapy, the percentage of recovery of the group receiving psychotherapy (41.2 percent) was higher than the percentage of recovery of 15.4 percent of the group that did not receive psychotherapy (12). Another report indicated that there were no visible differences among the three groups of patients of neurasthenia subjected to the same psychotherapy using the double blinding method, effective medication, and sedatives. Among ordinary patients treated by psychotherapy, the group given medication showed more positive results than those given sedatives ( $p < 0.05$ )(14). Another contrast study showed comprehensive treatment was much better than psychotherapy(15). These studies show psychotherapy in comprehensive treatment exerted the major effect but medication also had a definite function.

The long term effect of comprehensive treatment was better. After 1 to 7 years of follow-up visits and survey(6,8,13,16), the percentage of firmly established effectiveness (including stabilization of the patient's condition and continued improvement) remained between 66 and 90.8 percent. In addition, the psychology institute conducted a series of experimental studies of the pathological and psychological characteristics and higher nervous activity of the patients treated for neurasthenia(6,7,16,17-20). It was discovered that

after treatment, the patients showed visible improvement in the experiments over their performance prior to treatment. The condition of improvement and the effectiveness of treatment were consistent, i.e., those effectively treated showed more visible improvement in the experiment. Another report showed serum cholesterol of patients of the anxiety neurosis type of neurasthenia was slightly high (150-260 milligrams%, the average is 190 milligrams%). After comprehensive treatment, this visibility dropped (to 120 - 180 milligrams%, average 140 milligrams%)<sup>(21)</sup>. These experiments showed comprehensive treatment improved the pathological state of mental functions.

In the comprehensive treatment of hypertension, psychotherapy similar to that used in treating neurasthenics was used. In addition, a collective method of treatment by inductive chi gong exercises<sup>(7)</sup> and verbal suggestion were used. These greatly shortened the time required to induce the patients to calm down. The quality of calming down is directly related to the effectiveness of the treatment. This type of feedback adjustment by verbal and self suggestion produced a better treatment effectiveness, as was popularized in many units of medical treatment.

In the comprehensive treatment of schizophrenia, the method of implementation of psychotherapy was also similar to that in treating neurasthenia. The characteristics of this treatment were as follows: (1) Psychotherapy was conducted during the period when schizophrenic symptoms were active. Contrary to the traditional view that psychotherapy is useless during the acute period of schizophrenia, it was believed that normal psychological activity, even though it may be very minute, can still serve as the basis for psychotherapy. It is used to stimulate the patient to develop his subjective mobility so that his pathological and psychological process can be transformed towards a normal direction. (2) Half of the period of treatment was for outpatient treatment to let the patient adapt to the family or work environment and to train him in that environment during the experimental period outside the hospital. This environment was made an important part of the treatment of schizophrenia and arrangements were made for the patient to work as soon as possible. The period of recuperation after leaving the hospital was not extended<sup>(22)</sup>.

## 2. Theory Concerning Psychotherapy

The psychotherapy conducted in the comprehensive treatment was completely opposite from the Freudian method of treatment of searching for the cause of the disease (emotional knot) in the subconscious theoretically or in practice. Psychotherapy emphasizes the regulatory function of conscious psychological activity in bodily functions under definite conditions<sup>(3, 10)</sup>. This psychotherapy combined persuasion, suggestion and our nation's unique chi gong exercise. The method of treatment by persuasion mentioned here is different from the persuasion method of Dubois and the persuasion method

of Morita<sup>(14)</sup>. We first take man as the organic body of dialectic unification of the true natures of society and nature. We emphasize that the patient's recognition activity takes the lead in the cause of the psychological disease and the treatment and also exerts an important function in non-psychological diseases. We teach scientific knowledge about diseases and conduct education in national trends and we elevate the patient's understanding from these two aspects. Psychotherapy requires patients to change their attitudes towards disease, work, learning, life and relationships with others. The social responsibility of the patient to treat diseases and their self consciousness in fighting against the disease are inspired to take the initiative in overcoming certain weaknesses in personality, to solve the cause of the disease, and to adjust their relationship towards work, learning, life and other people<sup>(7,10,14)</sup>. Therefore this psychotherapy is guided by dialectic materialist thought and is theoretically based upon developing man's "self conscious mobility"<sup>(7)</sup>. Through treatment, the patient develops an active understanding of the disease and an active will to overcome the disease (practice of self cure), and establishes an active psychological state. Therefore, this psychotherapy can also be called "active psychotherapy" to reflect the characteristics of its content and nature<sup>(10)</sup>. Then we emphasize the guidance and demonstrative functions of medical personnel. Their enthusiastic service and scientific guidance for the patients take up the task of curing the patients as their own social responsibility, fully mobilize the medical personnel's subjective mobility, and use their actual activities to influence the patients. In the doctor-patient relationship, the doctor's function as well as the active initiative of the patient are both emphasized. In addition, the good atmosphere created in group therapy and the mutual encouragement among the patients are utilized to further mobilize the patients' subjective mobility.

### 3. Evaluation of Psychotherapy in Comprehensive Treatment

Comprehensive and rapid treatment of neurasthenia achieved success in all categories of people<sup>(14,16)</sup>. At the beginning of the 1960's, Beijing city's medical circles applied this new method of treatment that embodies the principles of psychotherapy in the treatment of over 70 chronic diseases including diabetes, chronic pelvic infection gestosis, arthritis and glaucoma. A so-called "fast treatment of chronic diseases" movement was formed. More effective treatment than in the past was realized. These showed that the effectiveness of treatment of many chronic diseases was visibly elevated because of the emphasis on psychotherapy based mainly on developing the patient's subjective mobility as the major content. This psychotherapy requires the patient to seek the method to overcome his own psychological causes and the changes in the patient's pathological and psychological processes before and after treatment are systematically observed. This is a practice that has been neglected or is difficult to implement in some foreign schools of psychotherapy.

The "fast treatment of chronic diseases" movement of the time used the same method to treat various kinds of chronic diseases and emphasized results within a short time and inappropriately used methods of treatment that violated the developmental patterns of each kind of diseases, therefore the movement collapsed without continuing for too long. The shortcoming of this method of treatment is that it requires the patient to set aside a certain period for treatment every day for a short period. Medical personnel participating in the treatment correspondingly increased and sometimes the difficulties of the patients and the hospitals were compounded. In the future, when outpatient service uses electrically operated educational equipment, and when the form of group psychotherapy is changed, and when the content of individual psychotherapy is increased, this method of treatment will still be a good method to raise the effectiveness of treatment.

## II. The Study of the Psychological Causes of Psychosis, Hypertension and Their Pathological and Psychological Characteristics

Our nation has conducted much research in the psychological causes of neurasthenia. The Beijing Medical College surveyed 25,471 persons of various professions to survey the percentage of neurasthenia and proposed that psychological factors (psychological injuries and negative emotional experiences) are the major causes of neurasthenia. The percentage of occurrence of the disease varies greatly in different types of work<sup>(13)</sup>. Some other authors have pointed out the percentage of occurrence of the disease varies according to different working environments. Whether the nature of the work creates tension is an important condition causing the disease<sup>(9)</sup>. The psychology institute once classified the psychological factors in objective reality that affect man and put the disease into three categories: 1. Inappropriately long periods of tension in work or learning. 2. Noncoordination of human relationships at work or at home. 3. Great misfortunes in one's life<sup>(4)</sup>. It was believed that the patient's understanding of work, learning and incidences of life exerts an important function in the occurrence and development of neurasthenia<sup>(9)</sup>. Understanding is also closely related to the characteristics of the person's personality. For example, most of the patients possess such weaknesses of character as being impatient, easily angered, sensitive and suspicious, and keeping one's anger to oneself. These personalities are related to their getting the disease<sup>(15)</sup>. Different opinions are held regarding the function of the characteristics of the types of nervousness as a causative factor of the disease. Some observed that most of the patients are of the strong and imbalanced types and possess characteristics of the weak type<sup>(23)</sup>. Some others observed that there are patients of all types. Extreme types constitute only a minority of patients<sup>(9)</sup>. Still others analyzed the psychological factors that caused or intensified neurasthenia, and besides the cause of the disease and weak personality, they introduced two types of concepts of the vicious circles. Between 80 and 90 percent of the patients believe these two types of vicious circles affect one's own condition of being sick. Only one-third of the patients concluded from analysis that the

cause of the disease and personality weakness affect their own condition of the disease. Via psychotherapy, 80 percent of the patients basically discarded the factor of the two types of vicious circles. Part of the patients eliminated the cause of disease but most of the patients (81 percent) did not eliminate personality weakness<sup>(14)</sup>. Another author believes most of the patients (429 out of 650 cases, or 66 percent) at first denied that the occurrence of the disease was due to psychological reasons but after detailed questioning they finally admitted that it did. Analysis showed that the patient's denial of psychological causes of the disease is not unconscious and is not entirely purposefully hiding but is an incorrect understanding of the disease<sup>(24)</sup>. Some people also observed that patients who understand their personality weakness and who exert efforts to overcome it have been treated effectively with firmly established effectiveness while the effectiveness of the treatment of those that did not have such understanding and did not make such efforts was established less firmly<sup>(15)</sup>.

In the study of the psychological causes of hypertension and the characteristics of personality prior to the occurrence of the disease, a situation similar to that in neurasthenia was discovered<sup>(7)</sup>.

In the study of the pathological and psychological characteristics of neurasthenics, some authors observed that the patient's incubation period is longer than that in the healthy person in recognition reaction experiments. Fluctuations during the incubation period were also greater. There were mostly two types of fluctuations, one is greater fluctuation at the beginning and the end of the period and the other is a gradual increase in the fluctuation<sup>(20)</sup>. Later experiments increased the suppression of recognition reaction, and observed that the occurrences of suppression of reactions of the patients was less than normal persons<sup>(19)</sup>. The authors believed this phenomenon is the result of the weakening of the functions of the nervous process of the cerebral cortex. Some authors studied the electroencephalograms of neurasthenics. Their manifestations were relatively consistent with clinical symptoms<sup>(26)</sup>. Some discovered that the rest curve of electrical reflection of the skin of patients has its characteristics while the degree of intensity of the symptoms felt by the patient himself is weakly correlated positively to the degree of the electrical reaction of the skin<sup>(27)</sup>.

Some authors used memory experiments and observed that the patient's memory of drawings or verbal terms, memory of mechanical objects of different materials and memory of meanings were all poorer than normal people<sup>(18,19)</sup>. Some other authors used experiments of the sense of time and observed that patients were not as accurate in estimating the duration of 8 seconds or 15 seconds than ordinary persons<sup>(19)</sup>. Association experiments showed that patients required a longer time for associative reactions and gave more repetitive reactions<sup>(16)</sup>. Patients also especially missed many answers<sup>(25)</sup>. Some authors summarized these phenomena as the pathological and psychological characteristics of neurasthenics and a manifestation of the reduced efficiency of psychological activity<sup>(19)</sup>.

Some authors also studied the pathological and psychological characteristics of convulsive and conversion hysteria. The results showed the efficiency of psychological activity of hysterics visibly dropped and their higher nervous activity is visibly hindered(19).

These studies described above show that the higher nervous activity and psychological functions of the patients are definitely hindered and thus this deepens the understanding of the disease. They provide an objective basis for treatment, elevate the quality of clinical diagnosis and treatment of neurasthenia. This kind of research of the pathological and psychological characteristics in combination with treatment has important theoretical and practical significance. This is not frequently seen abroad and is worth further development. At the same time, some psychological diagnostic methods that are simple and easy to apply should be explored.

### III. Study of the Pathological and Psychological Characteristics of Psychotics

In the study of the pathological and psychological characteristics of psychotics, more studies have been conducted in the hindrance to the thinking of schizophrenics(28). These authors mostly designed their experiments on the basis of the method developed by Soviet scholars Protopopov et al., and they obtained similar results. Some authors used pictures and word classifications, classification of objects and the fourth exception methods to study the process of abstraction of schizophrenics. It was discovered that the patients performed poorly and took more time to complete the experiments than healthy persons and there were abnormal classifications. The results of the experiments had a definite relationship to cultural levels. Some of the patients showed difficulty in understanding the instructions and forgot the task of the experiment in the middle of the experiment. Some found it difficult to understand hints and to correct mistaken methods(29). Some researchers discovered that most patients did not have a high quality of abstraction, their concepts were confused with symbolic nature and some even could not form concepts. Some patients could not judge between the correct and the mistaken objects and could not find the cause and effect relationship or judge conflicts. At the same time their derivation and logical conclusions were wrong, they digressed and reached ridiculous conclusions. The ability to understand also is superficial, unilateral and ridiculous. This was manifested by hindrance in the utilization of original practical knowledge, and abilities and the creative utilization of the ability of the patients(30). In addition, the characteristics of the associative thoughts of the patient were also studied and it was discovered that their reaction was slow, the quality of their responses was low, their content was monotonous and poor, and many abnormal associations occurred(28,31). Another author studied the hindrance of schizophrenics to comprehend numerical concepts by studying their recognition of numbers, number series and real number(32).

There were also authors who studied the free memory of the short-time memory of schizophrenics and believed the memory characteristics of patients were the lack of organization of material in recalling the past(33). Some conducted experimental studies of the illusions of volume-weight of schizophrenics. It was discovered that schizophrenics of the late stage showed the lowest Charpentier illusion rate. The author believed the loss of illusion may be a kind of manifestation of a hindrance to the senses and consciousness of late schizophrenia(34).

In addition, some authors used pure sounds of two different intensities as stimuli to study the simple reflexes of paranoid schizophrenia. It was observed that patients with different symptoms all had a longer reaction time for simple reactions than normal people. Those with active symptoms had the slowest reaction time, followed by those with unstable symptoms and those whose symptoms were slowly resolving reacted faster. The degree of severity of the hindrance to the functions of the cerebral cortex as indicated by whether the patient can clearly recognize the intensity pattern of the two kinds of intensity stimuli and the length of the reaction time was discovered to have a consistent relationship to the severity of the clinical symptoms(35).

According to the already published documents mentioned above, our nation's workers in medical psychology and psychiatry have used psychological experiments or tests to conduct some beneficial trials in the study of the characteristics of thoughts of psychotics and other pathological and psychological characteristics. They have also made comparisons within each field with normal persons. But the results of different units at present cannot be compared qualitatively or quantitatively yet. For example, in conducting classification experiments using pictures, words or objects, the samples are similar but because the methods are different (different instructions and different methods of demonstration), the results are different. In addition, the condition of illness of the patients or the effectiveness of treatment are judged according to each one's own clinical observation and there is no definite amount of observation and other effective guides, therefore whether the changes in the pathological and psychological characteristics of the patients can truly reflect the change in the condition of the illness or what relationship these changes have with the effectiveness of treatment still require further analysis. In recent years, some psychiatric hospitals have taken a more active attitude towards the clinical use of psychological testing to explore the pattern of psychological changes of psychotic patients. They have begun to establish various diagnostic tables and select some frequently used clinical psychological tests (such as the Wechsler adult intelligence test) and have revised some to adapt to our nation's situations. The Hunan Medical College also holds a training class in psychological testing to train some doctors with clinical experience to conduct work in this regard. The future trend should combine the study of clinical observation,

psychological testing, experimental psychology and neurological, physiological and biochemical experiments, and thus provide more scientific information on the mechanism of occurrence of psychosis and the neurophysiological basis of psychology.

#### IV. Study of the Psychological Problems in Acupuncture Anesthesia

Acupuncture anesthesia is a new kind of creation based on our nation's medical practice of using acupuncture to kill pain applied to surgical anesthesia. Acupuncture anesthesia used in surgery involves operating on the patient while he is in a conscious state. The effect of man's psychological activity in this situation gained attention not long after the application of acupuncture anesthesia. Beginning in 1965, our nation's psychological workers conducted some research in this regard, especially since 1973. The major results are as follows:

##### 1. The Function of Psychological Factors in Acupuncture Anesthesia

Some authors have observed that acupuncture anesthesia on patients who are tense when entering the operating room is less effective. Patients who are tense are more tolerant to the needle than calm patients. The periodic pain felt by the probing and puncturing by the needle produces a poorer effect. Physiological fluctuations at the time of entering the needle and after acupuncture are both large(36,37). This is that a tense emotional state interferes with the normal development of the effect of acupuncture. They also observed that emotional states are closely related to breathing, pulse, cortical hormone in the blood and the state of such psychological functions, and are also related to worry about acupuncture anesthesia, the correctness of estimating the time, the comprehensive sensitivity of the senses of the skin and such psychological characteristics. These show that emotional state is closely related to many psychological and physiological functions. The effect of tense emotions upon the effectiveness of acupuncture anesthesia may be related to the fact that it replaces the bodily functions in many aspects in an unfavorable state(36).

Work in this regard shows emotional states are important psychological factors affecting the effectiveness of acupuncture anesthesia. Some possible explanations of how they affect the effectiveness of acupuncture anesthesia were proposed. These all have a definite significance in the clinical study and the study of the principles of acupuncture anesthesia.

Is the ability of acupuncture to kill pain due to suggestion? Much research has been conducted at home and abroad regarding this question, and different results have been obtained. In 1973, some authors in our nation observed that the effectiveness of acupuncture to kill pain was poor in persons easily susceptible to suggestion(38). In 1976, work in combining suggestion and acupuncture showed the threshold of pain was greatly elevated after acupuncture treatment. The group of patients that were given acupuncture treatment

alone had the second highest rise in the threshold of pain and the rise in the threshold of pain of patients given suggestion alone was the least. Therefore it was believed that under conditions of acupuncture anesthesia, acupuncture exerted the major effect and suggestion and such psychological factors exerted an auxiliary effect<sup>(39)</sup>. Some authors observed on the body of patients subjected to clinical acupuncture anesthesia that suggestion can visibly elevate the threshold of pain and the threshold of electrical sensitivity. But the difficulty or ease of the patient to accept suggestion does not have any visible relationship to the effectiveness of acupuncture anesthesia.<sup>(40)</sup> They also tested normal persons and observed that the effectiveness of acupuncture is related to the change in the substances in the blood but has no relation to the susceptibility to suggestion or the faith in the ability of acupuncture to kill pain. Accordingly, it was believed that the ability of acupuncture to kill pain has its material basis and it cannot be explained by suggestion and such psychological factors<sup>(41)</sup>. Other work also showed that suggestion does not exert an important effect upon the effectiveness of acupuncture to kill pain<sup>(37)</sup>.

Abroad, some people have used the theory of signal texts to analyze the effectiveness of acupuncture to kill pain and obtained conflicting results. Our nation's researchers also used this method to analyze acupuncture to kill pain and they were the first to use nalorphine, the antidote to morphine, to observe its effect upon the effectiveness of acupuncture. The results show that acupuncture lowers the differentiation of pain and the level of painfulness is raised. Fake needling has no effect. Nalorphine basically eliminates the original effect of acupuncture to kill pain. This shows acupuncture to kill pain is basically a kind of physiological effect, not the effect of suggestion or such psychological factors<sup>(42)</sup>. Other work in this regard also obtained similar results<sup>(41)</sup>.

The above work obtained basically consistent results showing suggestion can raise or lower the threshold of pain but it does not have any visible relationship to acupuncture to kill pain. Suggestion is not the major factor that determines the effectiveness of acupuncture anesthesia. But clinically because of the trustworthy attitude of the medical personnel and the demand for treating the disease, suggestion may have a definite effect.

In addition, some other psychological factors, such as distraction<sup>(37)</sup>, recognition and worry<sup>(36,37)</sup>, the state of mental preparation<sup>(41)</sup> etc., and their effect upon acupuncture to kill pain or acupuncture anesthesia have also been studied. It was observed that they have a definite effect upon acupuncture anesthesia but the effect varies according to the individual.

Among the psychological factors, the emotional state exerts the most visible effect upon the effectiveness of acupuncture. Actually, this is basically the same as in the situation of psychological causes of disease, such as in the previously mentioned neurasthenia and hypertension. Psychological factors

(mainly through emotional factor) and their important significance to cardiovascular diseases, some "psychological and physical diseases", cancer etc, have attracted more and more attention. Studying the mechanism of emotional factors in causing diseases or in curing diseases has a widespread and important significance in medical psychology. The work in acupuncture anesthesia is only a beginning. The factor of suggestion exists widely in medical treatment. Work in these regards is worth profound study.

## 2. The Function of Some Psychological and Physiological Characteristics in Acupuncture Anesthesia

The individual differences in the effect of acupuncture anesthesia have been observed very early. This difference may be related to certain psychological and physiological characteristics.

The characteristics of man's sense of pain and its relationship to the effectiveness of acupuncture anesthesia received attention the earliest. A lot of work showed that the degree of tolerance to pain is visibly related to the effectiveness of acupuncture<sup>(43)</sup>. Some other work showed that the sensitivity to electric shock is related to the effectiveness of acupuncture and the sensitivity of several senses of the skin (including pain, touch) is even more closely related to the effectiveness of acupuncture<sup>(41)</sup>. The tolerance to acupuncture and the sensing of the acupuncture are also related to the effectiveness of acupuncture to kill pain<sup>(37)</sup>.

Suggestive susceptibility itself is also a kind of individual characteristic. Its relationship to acupuncture to kill pain has been described above. The relationships between some other psychological characteristics and acupuncture to kill pain have also been explored<sup>(38,41)</sup>. The characteristics of pain, touch, and the sense of being needled are closely related to the effectiveness of acupuncture. This may possibly be due to the fact that they are more directly related to the process of acupuncture to kill pain.

## 3. The Study of the Psychology of Pain

As described above, the susceptibility to pain is affected by many factors such as emotion, suggestion, distraction and the state of mental preparedness. For example, suggestive susceptibility and sensitivity of pain are related. The more sensitive to pain, the easier the acceptance to the suggestion of pain<sup>(40)</sup>.

Some work studied the cyclic and rhythmic patterns of the threshold of pain and observed that the threshold of pain of the skin of the human body itself shows an obvious 6-month cycle of change. The threshold of pain in spring and autumn is higher and the threshold of pain in summer and winter is lower<sup>(44)</sup>. Some others observed that suppression of the emotion to pain by electroacupuncture is visibly greater than that of the sensation of pain.

Neuroelectro-acupuncture and electroacupuncture at acupuncture points produce the same results<sup>(45,46)</sup>. This work brought out the problem of the nature and content of pain and has a definite significance in explaining the phenomenon of pain in clinical acupuncture.

In addition, the problem concerning the objective indicators of pain was also studied<sup>(47)</sup>. Study was also conducted in the changes in skin sensations other than pain after acupuncture<sup>(48)</sup>.

Because the emotional state, the threshold of tolerance to pain and the comprehensive sensitivity of the skin's sensations are all closely related to the effectiveness of acupuncture anesthesia, their characteristics are thus simultaneously significant in forecasting the effectiveness of acupuncture anesthesia.

In general, the study of the psychological problems in acupuncture anesthesia basically clarified the problem of the function of psychological factors in acupuncture anesthesia. It has stimulated the exploration of the problems concerning the psychology of pain, psychology of emotion and individual differences which are topics in psychology seldom studied in the past. At the same time, it proposed the new topic of how to study the sensation of acupuncture from the point of view of psychology.

#### V. Psychological Diagnosis of Intellectually Retarded Children

Psychological diagnosis of intellectually retarded children has been a traditional subject of medical psychology. At the beginning period of Liberation some people attempted to revise the Wechsler adult intelligence scale. Later work in this regard was halted for a long time because of the influence of the Soviet Union's criticism of experimentation.

In 1962, due to the need of determining the intelligence of child patients of regional Kaschin-beck disease, some authors devised a set of scales to measure sensory motion, memory, directional judgment, abstraction and generalization, and numerical computation ability and tested children 3 to 7 in age in three regions. The results showed that the items selected can be divided into age differences and the levels of psychological development of children of different regions are visibly different. Therefore it was believed that it was impossible to exclude environmental and educational influences from the tests and a set of tests for psychological diagnosis applicable in all parts of the nation cannot be hoped for<sup>(49)</sup>. Later on, to better adapt the characteristics of the children of Kaschin-beck disease of having hearing and speech difficulties, and based on a survey of the work ability and the life of normal children in the infertile areas, non-verbal tests and training and observation of affected children, "a preliminary plan for the classification of hindrance to intelligence of children of

regional Kashiwa-beck disease" was drafted on the basis of the survey of the life and work ability and simple tests for determining intelligence. But this plan was suitable for use only for older children and it was difficult to use it to determine the effectiveness of treatment, further improvement was needed.

More recently, some work studied 150 intellectually retarded children. The work was based on regulation of life, language and numerical recognition and computational ability. The degree of hindrance was classified into six categories and illustrated in a "tabular method" to determine the effectiveness of treatment. It was believed that this was applicable to a definite degree (50).

In general, retardation is an important problem. Very few studies have been done in this regard in our nation, and they are not sufficiently systematic and in depth. To facilitate international exchange and clinical application, drafting of some better and internationally applicable intelligence tests is needed. But the study of the psychological and pathological characteristics of intellectual retardation should be combined with the study of the causes of the disease so that it can truly develop the function of psychological "diagnosis."

In addition to the work in the several major aspects mentioned above, better effectiveness of treatment was also realized in the use of hypnosis to treat psychosis, the use of behavioral correction to treat purpose psychosis. In 1958, a psychosis prevention network was set up in certain street sections in mental health work. Mental patients were hospitalized during the day and psychological consultations were set up in mental hospitals. In pathological and psychological work, clinical and laboratory animal studies were conducted for domestically produced herbs that produced hallucinations. Work has also been done in the compilation of Chinese medical and psychological thinking found in our nation's ancient books and medical books. In general, our nation's workers in medical psychology have during the past 30 years combined the actual situation in our nation's medical science in their work related to theory and practical applications and have done a lot of work. Generally, speaking, because educational institutions of psychology did not establish special training to train a staff of personnel in medical psychology, and medical colleges also did not set up courses in medical psychology, all fields in the medical sciences, except psychiatry circles, did not include medical psychology in their daily schedule. The work in medical psychology that has already been launched is not wide. Only some studies have been conducted in a few realms.

At present, our nation has already entered into the period of the glorious transformation towards the four modernizations. Medical psychology must contribute towards the four modernizations. For this, medical psychology must rapidly utilize advanced techniques and facilities of scientific

experimentation to greatly develop basic research in the relationship between psychology and the brain under the guidance of dialectic materialism. Regarding the topic of studying the relationship between psychology and physiology in patients with hindrances of brain functions, the characteristics of psychological hindrances in thought and memory, and senses formed on the basis of our nation's words and languages must be studied and a set of psychological testing items suitable to our nation's situation must be established to provide scientific data on the patterns of psychological activity and the true nature of psychology of the abnormal. In addition, studies of the mutual effects of each disease and psychology in each medical and clinical field must be launched to study the function of psychological factors (especially emotion) in causing and in treating various diseases. In psychological treatment, various methods such as behavioral treatment must be greatly popularized and be combined with effective methods of medical treatment. In mental health, outpatient service for psychological consultation must be set up in general hospitals and specialized hospitals gradually. Particularly in the work concerned with youths and children and environmental protection in anti-pollution work, mental health education must be conducted systematically so that the people's mental and physical health can be assured and taken care of as they should.

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## LIFE SCIENCES

### DEVELOPMENT OF PHYSIOLOGICAL PSYCHOLOGY OVER THIRTY YEARS DISCUSSED

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#### [Text] Abstract

This article is a historical retrospect by periods of the 30 years of research in physiological psychology in our nation. It also discusses some major achievements, experiences, lessons and some prospects.

Our great motherland is now 30 years of age! It is worth the effort to conscientiously look back at the 30 years of historical progress in the study of physiological psychology in our nation, the major achievements, lessons and experiences. This retrospect will undoubtedly benefit the healthy development of our nation's physiological psychology in the new era.

#### Historical Retrospect

Physiological psychology is an important branch of psychological science. It is very important to an understanding of the psychological process and the nervous mechanism of psychological activity and the development of psychological science.

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In retrospect of our nation's 30 years of progress and major achievements in the research in physiological psychology, we have divided the progress into the following four historical periods.

#### The First Period (1949 - 1958)

Because of the party's direct care and support, the Psychology Institute was built in 1951. In the movement of socialist ideological reform in 1952, most of our nation's workers in physiological psychology recognized that they must self consciously be guided by Marxism, exert efforts to learn the theory of Pavlov on higher nervous activity and his research method of conditioned reflex to reform and rebuild our nation's psychological science.

Between 1952 and 1956, the entire nation launched the wave of enthusiasm to learn Soviet psychology and Pavlov's theory. The Central Health Ministry held meetings in all large cities of the nation in a systematic way to learn Pavlov's theory with the help of the Chinese Academy of Sciences and the National League of Sciences. In 1952, Beijing University set up a laboratory for studying conditioned reflex of animals. Not long afterwards, the research institutes and higher educational institutions in Beijing, Shanghai, Nanjing and Changsha, such as the Psychology Research Laboratory of the Chinese Academy of Sciences (1953) and the Psychology Department of Nanjing University (1954) separately established corresponding laboratories. The psychology research laboratory (1954) also set up a conditioned reflex laboratory suitable for experimenting on human beings. Research work during this period included mainly three aspects. Research in the first aspect emphasized the study of the ability of analysis and comprehension of animals such as the use of alternate differentiation to study the formation of suppression<sup>(3)</sup>, and the study of the ability to analyze tones<sup>(4)</sup>. The research in the second aspect involved attempts to directly interfere in the central brain, such as the use of electric current to directly stimulate the cerebrum of animals.<sup>(5)</sup> The research in the third aspect used human beings as subjects to study the communication system of the first and second signals of children<sup>(6)</sup>, reaction of the order of establishment of movement and dynamics<sup>(7)</sup>, etc.

The early period of the first period of our nation's research in physiological psychology can be called the learning period. This period centered around the enthusiastic learning of the theory of higher nervous activity and the research method of conditioned reflex of Pavlov of the Soviet Union. In December, 1956, at the inauguration of the Psychology Institute of the Chinese Academy of Sciences, and its scholastic discussion meeting, a total of 20 research papers were presented, and most of them dealt with the research in physiological psychology of the type described above<sup>(8)</sup>.

Major achievements during the early period of the first period were made in at least the two following aspects. First, through ideological reform and

the enthusiasm in learning, most of our nation's researchers in physiological psychology realized that they must strictly study the material body or psychological phenomena (nervous process) (Lenin)<sup>(9)</sup>, and they clearly proposed the guideline for research of that time<sup>(1)</sup>. Then, various conditioned reflex laboratories were set up at each locality throughout the nation and they began experimental explorations and from them a research team in physiological psychology in our nation was formed gradually. A group of students were sent abroad to study. But an obvious weakness existed in the research in physiological psychology in our nation during this period. For example, the above research work mostly were confirmation of the experimental results of Pavlov's theories. "There were very few creative experiments."<sup>(8)</sup> In methodology, work in the direct exploration of the relationship between the cerebrum and psychology was rarely seen. Also, learning of the results of internationally advanced research was basically limited to Pavlov's school of thought of the Soviet Union.

Major characteristics of the late period of the first period of research in physiological psychology in our nation were realized in the following two aspects. The first was from the rectification movement of 1957 to the time before August, 1958. During that time, the major emphasis was on solving the question of how psychology could better serve socialism. At that time, one could hold on to his own opinions in debate. Academic discussion and contention could be debated over the direction of research. Also, the debate greatly pushed forward research work in branches of psychology. The achievements were welcomed.<sup>(12)</sup> But after August, 1958, academic contention was replaced by the "movement to criticize psychology." Administrative order replaced the party's "double hundred" policy [let a hundred flowers bloom and a hundred schools of thought contend]. Traditional psychology was criticized as "capitalist class psychology" and "fake science", research in physiological psychology was criticized as "biological in nature" and "physiological determinism" etc.<sup>(10)</sup> Research in physiological psychology became the major target of attack in the "criticism movement." The other characteristic was the continued publication of research reports concerning the branching out of physiological psychology<sup>(13-18)</sup>. The debate still continued<sup>(10, 19-25)</sup>. The research work published in physiological psychology during this period included the regular research in animal and human conditioned reflex of the learning period described above<sup>(18-13)</sup> and also some research which attempted to introduce electro-physiological methods (such as electrical reflection of the skin<sup>(14)</sup>) and brain chemistry techniques (such as injections into the brain<sup>(16,17)</sup>). These are factual manifestations that our nation's work in physiological psychology would not be satisfied by only one school of thought and one technique.

#### The Second Period (1959-1965)

From March 1959, when the Chinese Academy of Sciences invited representatives throughout the nation to participate in the psychology working

conference in Beijing to October 26, 1963, when GUANGMING JIHBAO published an article of criticism penned by "Ge Ming Ren" constitutes the second period in the history of our nation's research in physiological psychology.

Because of the call of the party's policy, academic contention was revitalized at the psychology working conference in March of 1959. Delegates unanimously believed that the achievements in reforming and rebuilding our nation's scientific psychology since Liberation must not be wiped away. In May of the same year, the psychology circles in the nation's capital again held a discussion meeting on basic theory. At the same time, discussion meetings were held one after the other in Shanghai, Nanjing, Guangzhou, Xian, Changchun, Hefei and Wuhan. The criticism of 1958 was politely but firmly rebutted for the first time<sup>(11)</sup>. In 1959 in the XINLI XUEBAO [JOURNAL OF PSYCHOLOGY] alone, there were over 20 articles of academic contention. Some people believed this was an unforgettable year in which there was a bumper harvest in the research in basic theory in psychology<sup>(12,45)</sup>. A common understanding which was welcomed and which was relatively more unified inward dialectics was realized through the contention of hundred schools of thought during this period concerning the fundamental questions of the necessity of studying the physiological mechanism of psychological processes, and the relationship among psychology, physiology and the brain.<sup>(27,28,26,37,28,29)</sup> Many researchers believed that strictly studying the material body of psychology--the nervous process, is the direction of major efforts in the research of physiological psychology. Later, research in physiological psychology in our nation entered the second period of history and began to prosper and progress.

Research work during this period, whether in quality or quantity, in subject matter or in techniques and means, such development and elevation were made in at least the following five aspects. The first was the continued study of the patterns of higher nervous activity using animals or human beings as subjects such as the study of the pattern of conditioned reflex reactions of animals to compound stimuli<sup>(30)</sup>, or the study of age characteristics of higher nervous activity in children<sup>(31,32)</sup>, etc. The second was the attempt to analyze the relationship between conditioned reflex activities and certain portions of the brain, such as the function of the cortex in defensive conditioned reflex activities<sup>(33)</sup>, and also observation of the effect of delayed reaction of animals after removal of the frontal lobe of the cortex.<sup>(34)</sup> Another aspect of study began to pay attention to the effect of psychological factors upon certain physiological activities, such as studies which centered on the effect upon activity of the blood vessels of the skin<sup>(35)</sup>, or the study of the effects of certain psychological factors upon the electricity of the skin<sup>(36)</sup>. The fourth aspect of research work achieved rapid development during this period, such as the relatively systematic study of the "encephalograms of the Chinese" represented by the work of the Psychology Institute<sup>(37,38,39,40)</sup>. The last aspect of research

was represented by the work of the Pharmacology Institute of the Chinese Academy of Sciences and the Physiology Institute. The attempts to explore the senses and the mechanism of brain chemistry of higher nervous activity with the help of research methods using adocames(41,42,43,44).

In general, during the first half of the 1960's, the major characteristic of our nation's research in physiological psychology was the multiplicity and the wide scope of research topics in the methods of research. These major achievements during this period were in the following three aspects. First, if we consider the first period as a period from learning to a realization that we must "strictly study the material body of psychological phenomena (nervous process)", then this period was the use of experimental research and exploration to develop our nation's research in physiological psychology and to gain a more profound understanding through research practices. Also, progress in experimental research showed that in learning the internationally advanced techniques and schools of thought, limiting oneself to one technique or one school of thought obviously cannot suit the needs of research in physiological psychology. Therefore, such advanced means of the times as brain damage studies, electro-encephalography and injection of trace amounts of medicines into the brain began to be introduced into our nation. Secondly, if we say that the level of research work in the 1950's in physiological psychology in our nation was mainly marked by the objective study of conditioned reflex, then the level of research of the 1960's was mainly marked by the study of brain damage and electroencephalography. In addition, several researchers also tried to study thought (such as mental arithmetic)(40), words (specialized terms and emotional terms) as its relationship with human electroencephalographic activity.

#### The third period (1966-1976)

Following the publication on October 28, 1965, of the extreme "leftist" article by Yao Wenyuan under the pen name "Ge Ming Ren", he wrote a "letter of opinion" again in 1966. As the activities of the "gang of four" became rampant, our nation's only psychology institute had nowhere to go in 1969 and was forced to close down. Even though it was reopened in 1972, research work encountered many difficulties. This situation lasted until October of 1976 before crushing the "gang of four."

This period was characterized by the visible rampancy of the extremely "leftist" wave of ideology. Research work was forced to cease. Researchers were forced to leave. Research work in physiological psychology that was the realm of scientific research in basic theory could hardly continue. But the other characteristic of this period was that most of our nation's workers in physiological psychology still tried in every way to continue exploration and experiments. Most of them changed to the study of questions related to acupuncture to kill pain. During the latter period of this

period, the Psychology Institute set up a research laboratory (1972) for physiological psychology and pathological psychology. The Shanghai Physiology Institute set up a brain research laboratory.

During this period, our nation's research in physiological psychology mainly concentrated on the following three aspects. The first item was research related to the principles of acupuncture anesthesia. The Psychology Institute and the Physiological Institute and other related units and most of the staff and personnel in physiological psychology and medical psychology changed into this field. The second item was the study of questions related to physiological psychology in various tasks, such as the experimental study of the effect of lasers on the central nervous system etc. conducted by the biological physics institute and the Psychology Institute in coordination. The last item was in basic theoretical research. The Shanghai Physiology Institute and the Beijing Psychology Institute set up special topic research groups and began to explore the mechanism of the brain in memory and learning.

#### The Fourth Period (October, 1976 -----)

In October 1976, the "gang of four" was crushed. The spring in science arrived. In 1977, the State Council clearly instructed: "It is necessary to reactivate the Psychology Institute." In the same year, a 3-year, 8-year and long term plan for research work in physiological psychology were drafted in Beijing. The necessity and the goals of the struggle in basic theoretical research were clarified. In 1978, the Chinese Psychology Society revived its annual academic conference. In the same year, the Beijing University established a psychology department and a teaching and research laboratory in physiological psychology. This year, the XINLI XUEBAO was revived and some research reports on physiological psychology were published. The nation also held an acupuncture and acupuncture anesthesia conference and invited concerned foreign scholars to participate<sup>(53)</sup>. Recently, the Chinese Psychology Society held its third annual academic conference. Our nation's representatives of workers in physiological psychology again gathered together and held 5 days of academic activities on their own. A committee of physiological psychology was set up with the approval from the board of the Chinese Psychology Society. The executive committee member was concurrently held by Pan Su [3382 5486] who was head of the institute.

The spring in research in physiological psychology in our nation has arrived. The new long march has already begun. This is manifested by the second and third annual academic conferences of the Chinese Psychology Society. At the last annual conference, there were only three representatives of physiological psychology (who came from the Psychology Institute, the Physiology Institute, and University of Beijing). Only three papers which were research reports on the hippocampus and memory were read<sup>(47,50)</sup> and several reports on experiments in the relationship between acupuncture to kill pain and

psychological factors<sup>(48,49)</sup>. Yet, nine official representatives participated in this year's annual conference and there were three observers and four guests. These representatives came from nine units (Beijing Psychology Institute, Beijing University, Shanghai Physiology Institute, Kunming Animal Institute, Guiyang Medical College, and the College of Traditional Chinese Medicine, Shenyang Chinese Medical University, Nanjing University and Jiangxi Medical College). Sixteen research papers were read and four general reports were presented. Director Pan Shu [3382 5486] came to the meeting and gave a talk to encourage the work. This is one of the major achievements during the 3 years of the new period in our nation's physiological psychology. Also, the various interference and sabotage of our nation's physiological psychology by the "extreme leftist" thought of the previous periods was profoundly criticized and academic contention was revived. New recognition was relatively quickly obtained. This is an important achievement in yet another aspect.

The research work in our nation's physiological psychology in the first 3 years of the new long march is discussed below in five aspects taking the two annual psychology meetings and the national academic discussion meeting on acupuncture and acupuncture anesthesia. The first type of research was the observation of animal behavior and conditioned reflex. A lot of work was originally research topics of the second period such as the comparative study of nervous versatility of different species of monkeys and baboons (psychology institute, Kunming Animal Institute etc)<sup>(55)</sup>. The other type of research was on the effect of psychological factors upon acupuncture to kill pain such as the effect of suggestion and emotional state upon the effectiveness of acupuncture anesthesia<sup>(48,49,53)</sup>. In research, many physiological and psychological indicators were tried. Other research was strictly involved in the exploration of the mechanism of the cerebrum of animals. Of these, one type used lobotomy or electrical destruction method such as the effect of electrical destruction of the hippocampus upon the big white mouse's memory and learning of the maze in the black box (Psychology Institute)<sup>(52, 55)</sup>. The effect of lobotomy of the frontal lobe upon different types of instantaneous memory of the rhesus monkey (Shanghai Physiological Institute)<sup>(55)</sup> was also studied. Another type of research used electroencephalography and microelectrode techniques such as the effect of electrical activity of the hippocampus and the cortex upon memory and learning or upon probing reflection (Psychology Institute)<sup>(50)</sup>. Also, the effect of electrical stimuli and LSD injected into the mesencephalon's feng he qun [4911 2702 4028, seam nuclear group] upon the electrical activity of the neuron of the hippocampus of the domesticated rabbit in a state of conscious activity was studied (Physiology Teaching and Research Laboratory of the Guiyang Medical College and Psychology Institute)<sup>(55)</sup>. The relationship between electrical activity in the brain and acupuncture to kill pain was studied (Shanghai Physiology Institute, Fudan University etc)<sup>(53)</sup>. The last type of research work utilized some modern techniques of brain chemistry. In studying the relationship between cerebral endorphin and P substance and acupuncture to

kill pain (Shanghai Biochemistry Institute, Shanghai Pharmaceutical Institute, Beijing Animal Institute and Beijing Medical College etc)(53) and in studying chemical substances to induce sleep (Shanghai Physiological Institute)(55), attempts were made to introduce advanced cerebral peptide techniques. Also, injection of hydrolase of large biological molecules of protein and ribonucleic acid in the hippocampus were used to study the chemical mechanism of the brain of the big white mouse in remembering and learning the maze in the black box (Psychology Institute, Physiology Institute)(47,51,54,55). Injection of instrumental medicines such as carriers of nerve impulses into the side ventricles of the brain to study the effect of memory and learning of the animals and the effectiveness of acupuncture to kill pain (Physiology Institute, physiology teaching and research laboratory of the Beijing Medical College and the Shanghai Pharmacology Institute etc)(53,55). This kind of research successfully utilized the research techniques of instrumental medicines of modern injections in the brain. In addition, many units have analyzed the changes in content and the renewal rate of carriers of nerve impulses inside the brain when studying animal behavior and the mechanism of acupuncture anesthesia(53,55). Other units tried the use of radiative immunological techniques to study the relationship between cerebral endorphin and acupuncture to kill pain(53). Some units (Beijing University) studied the effect of neurological medicines such as lithium salts upon the content of the various types of carriers of nerve impulses(55). It can be seen from the above that in only 3 years, our nation's research in physiological psychology has already returned to a relatively high level. Achievements have been made and the future is bright.

### Experiences and Lessons

Looking back at the historical progress and major achievements in the research of physiological psychology in our nation, the goal is to digress less in the future. Let us summarize in general the experiences and lessons of the past 30 years.

#### I. The party's "double hundred" policy must be conscientiously implemented

In looking back at history we clearly see that the road of development of research in our nation's physiological psychology over the past 30 years was not smooth. There were corresponding periods of progress and prosperity and also periods of difficulties and stagnation. Why did such situations occur? We believe a major reason, which can also be called a major experience and lesson, was as follows: When the party's policy of "let a hundred flowers bloom and a hundred schools of thought contend" can be conscientiously implemented, then our nation's research in physiological psychology and research in other aspects of psychology will be able to develop and be elevated the same way. It can be clearly seen in the historical early period of the first period, the second period and especially the fourth period when

research in physiological psychology developed rapidly that the rapid development during these periods was possible because of the implementation of the "double hundred policy". The activeness of research and scientific personnel was mobilized to exert all their efforts together to push the progress in scientific research forward. On the contrary, when the "double hundred" policy was not heeded, then the development in physiological psychology was hindered. The "criticism movement", "abolition of the psychology institute" and the so-called "biological in nature" and "theory of reduction" that emerged during some periods mentioned above all were contrary to academic contention, thus suppressed and destroyed the development of psychology including physiological psychology in our nation.

Conscientious implementation of the party's "double hundred" policy is especially important to the development of our nation's physiological psychology. This is because our nation's physiological psychology which is an important branch of the basic science of psychology is still in a developmental period and a rather weak realm. The foundation is weak, the work team is small, the forces are scattered, it lags far behind, it has not been able to establish its own foundation well, therefore it receives blows easily and cannot stand up to them. We must implement the party's "double hundred" policy. The series of questions in basic theory of such a science must be gradually elevated by developing academic democracy. Also, many key questions should be studied and explored in depth by the broad masses of scientific research personnel and their efforts to engage in scientific experiments. In the practical course of absorbing and creating the advanced scientific theories and techniques, achievements should be fought for. Previous experience is the lesson for the future. The historical lesson of our nation's physiological psychology must be deeply remembered by us.

## II. The Question of Being So-called "Biological in Nature"

The "criticism" of our nation's research in physiological psychology being "biological in nature" was typified by some articles especially in 1958<sup>(10, 19, 20)</sup>. This view held that in the 1950's, our nation's physiological psychology circles were enthusiastically engaged in the building of laboratories, learning Pavlov's school of thought and his conditioned reflex method, and began to study the higher nervous activity of animals and to explore the psychological process and the physiological mechanism of learning activity. It was a trend of study taking psychology as a biological science and "regarding man as dogs."

As regards the question of whether the craze in learning Pavlov's school of thought during the 1950's was right or wrong, the evaluation of Pavlov's school of thought, and the evaluation of the scope of research presented by the Chinese Psychology Society during the first period, the authors agree with some of the analysis in the articles of the time and at the present (2, 11, 12, 22, 23, 26, 28, 36, 57, 58), and do not agree with the "extreme leftist" point of view.

Due to the limitation of space, we can only point out the following points. First, if we do not build laboratories, do not learn the gist of concerned international schools of thought, their methods of research and techniques and methods, do not rely upon animal specimens, how can we talk about exploring the physiological mechanism of psychology and utilize them to develop psychological science which is both "ancient and young"? By relying only on macroscopic description from philosophy to psychology and then from psychology to philosophy, can the secrets of the relationship between the brain and psychology be understood? Secondly, there is the problem of the correct evaluation of the trend and the task of research in our nation's physiological psychology. If we say that the problem of "regarding humans as dogs" has emerged to a certain extent, then whether this was a trend or a school of thought in our nation must be clarified. It has already been pointed out above that the foundation of our nation's research in physiological psychology is weak. At many units, research in physiological psychology is still at the beginning stage. And until now, their own foundation has not been well established. The "extreme leftists" have disregarded these facts and characteristics and have launched undue criticism of our nation's "biological trend" in the research of physiological psychology in our nation. This is truly unnecessary and is making something out of nothing. The damage was the killing of new born things. We must also point out that there is a view that attempts to blame Pavlov's school of thought for this so-called "biological trend". But such blame is very unfair. No matter what, the historical achievements of Pavlov's great school of thought cannot be erased. He opened up a new chapter in physiology and advanced a welcoming step forward in the exploration of the physiological mechanism of psychology. The contribution of Pavlov's school of thought to our nation's physiological psychology cannot be erased. He did not bring us the trend to "treat everything like dogs" but "objectivism" in psychology. Finally, it must be clearly pointed out that man and animals are fundamentally different in nature. Because of work and language, the human brain and the animal brain are truly different when compared. Therefore, the physiological mechanism of animal psychology cannot be wholesalely used for human beings. This is one aspect of the problem. But the human brain did evolve from the animal brain. The fundamental principles of the workings of the nervous system in humans and in animals have not been found to be different in any way. Many basic physiological mechanisms of human psychological activity have been explained by the results of research using animals as subjects.

The fact is criticism such as the so-called "biological trend", "physiological determinism" and "theory of reduction" did not conscientiously analyze the trend and tasks of the research in physiological psychology in our nation; they are indeed a kind of bias. History has proven that the "gang of four" has indeed caused profound damage to our nation's physiological psychology. The lesson of history must be taken as a warning!

### Some Prospects

As mentioned above, the historical course of our nation's research in physiological psychology during the past 30 years can be divided into the four historical periods of learning and "criticism", development, difficulties, and new long march. At present, the new long march has already begun. The staff committee has already been established. Then, what kind of situation will emerge in the research of physiological psychology in our nation during the 1980's and the 1990's? This is a question worth looking into.

The famous neurobiologist and Nobel laureate J.C. Eccles (1969) once described "the Future of Brain Sciences"(61). He pointed out that welcoming progress will emerge in at least nine large areas in these few decades. Among them, there are two great areas that belong entirely to physiological psychology which we are engaged in and towards which we are exerting our efforts. They are the study of the mechanism of the brain related to the senses and the study of the mechanism of the brain related to learning behavior. In fact, studies abroad in the two large areas mentioned above have progressed relatively quickly. The number of international academic meetings and publications is rapidly increasing. Yet, even though we are exerting all our efforts to catch up in the research of the mechanism of the brain related to memory and learning behavior as topics of research in our nation's physiological psychology, the level still needs to be elevated and the team of workers needs to be enlarged. In addition, even though our nation's research teams in the realm of the senses are not weak, yet the study of the mechanism of the brain related to the senses is still very weak. Therefore, to be able to freely surpass the internationally advanced levels, an important component in "knowing others to know oneself" is how to utilize and analyze the new trends in international research in physiological psychology(60,62,63,64,65,66). As the representatives of physiological psychology to the third annual meeting unanimously suggested, it is hoped that the board of directors of the Chinese Psychology Society and the staff committee of the physiological psychology can pay attention to expanding international academic exchange.

Comrade Pan Shu [3382 5486] talked about "The Future of Psychology"(59) at this year's national conference on basic theoretical research in psychology (March, 1979). He firmly believed: "The past was the period of development of physical sciences. Now it is the beginning period of the initial development of biological sciences. Later it should be the period of development of psychology. Before physics and chemistry are basically understood clearly, the development of biology will be limited. After biology and physiology have developed to a certain height, there will be good conditions for the development of psychology. At the same time, in social development, there will be an increasing need for psychology. Therefore, after the great development of biological sciences, there will be a great development in

psychology." As an important branch and vanguard of psychological science, physiological psychology will experience a relatively early and prosperous period of development! Welcomed major development may possibly emerge during the coming 1980's and 1990's particularly in the realms of the study of the mechanism of the brain related to the senses, consciousness, memory and learning.

Workers involved in the research in physiological psychology and education in our nation must unite and struggle to push our nation's building of the "four modernizations" forward and developing our nation's physiological psychology!

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9296

CS0: 4008

## SCIENTISTS AND SCIENTIFIC ORGANIZATIONS

### BIOGRAPHIC INFORMATION ON SCIENTISTS

[The following biographic information on selected scientists was extracted from the various Chinese-language newspapers as indicated in parentheses at the end of each name.]

Guan Weiyan [4619 1919 3508]

Deputy Director, Institute of Physics, Chinese Academy of Sciences. (Beijing GUANGMING RIBAO 23 Jun 80 p 1)

Hou Xianyuan [0186 2009 0337]

Director, Second Oil Refinery Designing Institute, Ministry of Petroleum Industry; 45 years old. (Beijing GUANGMING RIBAO 16 Jun 80 p 1)

Li Qingkui [2621 1987 6652]

Deputy Director, Nanjing Institute of Pedology, Chinese Academy of Sciences. (Beijing GUANGMING RIBAO 19 Jun 80 p 2)

Liang Jia [2733 0857]

President, Guangdong Provincial Academy of Sciences. (Guangzhou NANFANG RIBAO 20 Jul 80 p 1)

Qi Zhangqing [7841 0722 1987]

Chairman, Academic Committee, Lanzhou Institute of Biologicals; 65 years old. (Beijing GUANGMING RIBAO 22 Jun 80 p 2)

Song Jian [1345 0256]

A noted 48-year-old cyberneticist; was elected chairman of the board of directors, China Automation Society at its 3rd national congress held in Beijing late May 1980. (Beijing GUANGMING RIBAO 29 May 80 p 2)

Sun Shouchang [1327 1108 2490]

Former deputy director, Shanghai Institute of Plant Physiology, Chinese Academy of Sciences, died 29 Jun 80 at age of 66; a memorial service held on 12 Jul 80 at the Longhua Revolutionary Cemetery in Shanghai. (Shanghai JIEFANG RIBAO 15 Jul 80 p 2)

Wan Diao [5502 6860]

Deputy director, Shanghai Institute of Plant Physiology, Chinese Academy of Sciences; concurrently deputy secretary of the CCP Committee, Shanghai Branch, Chinese Academy of Sciences; sponsored a memorial service for Sun Shouchang [1327 1108 2490] on 12 Jul 80. (Shanghai JIEFANG RIBAO 15 Jul 80 p 2)

Wang Xizhi [3769 6007 2655]

Secretary of the CCP Committee at the Shanghai Institute of Plant Physiology, Chinese Academy of Sciences; on 12 Jul 80 he delivered an eulogy for Sun Shouchang at a memorial service held at the Longhua Revolutionary Cemetery in Shanghai. (Shanghai JIEFANG RIBAO 15 Jul 80 p 2)

Wu Jieping [0702 7132 1627]

Vice President, Academy of Chinese Traditional Medicine. (Beijing GUANGMING RIBAO 8 Jun 80 p 1)

Xu Caidong [1776 6846 2767], Prof.

Vice President, Guizhou Provincial Academy of Sciences; was recently honored as a national model worker. (Beijing GUANGMING RIBAO 8 Jul 80 p 2)

Ye Dequan [0673 1795 2164]

Director, Daqing Scientific Research and Design Institute; also member of the board of directors, China Micropaleontology Society. (Beijing GUANGMING RIBAO 20 Jun 80 p 1)

Yue Meizhong [1471 5019 0022]

Vice President, China Medical Society; chairman, Graduate School, Academy of Chinese Traditional Medicine; 80 years old. (Beijing GUANGMING RIBAO 6 Jun 80 p 2)

Zhu Mingkai [2612 2494 0418]

Director, Institute of Vegetables, Chinese Academy of Agricultural Sciences. (Beijing GUANGMING RIBAO 16 Jun 80 p 2)

AUTHOR: WANG Zhili [3076 0037 1331]

ORG: None

TITLE: "A Retrospect of Shanghai Symposium on Architecture"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 4, Jul 80 pp 1-4

ABSTRACT: The memorial service for LIU Xiaofeng [0491 4423 1496], the former Minister of Construction Engineering is over and his highly controversial speech "Creating A New Style of Architecture of China's Socialism", delivered at the Shanghai Symposium on Architecture in May of 1959 and used to brand him as a representative of the capitalist class within the party has been cleared and rehabilitated at the Hongzhou Symposium in 1979. In this paper, the author reviews the background of the Shanghai Symposium, controversial subjects in architecture since the liberation and throughout the cultural revolution, disagreements, personal attacks and counterattacks, and subsequent reversal and death. Sense of futility and despair is conveyed only between the lines, however. The paper concludes with a note of hope that hundred schools of architecture will freely contend under the correct leadership of the party.

AUTHOR: WANG Zhili [3076 0037 0500]

ORG: None

TITLE: "Developing Scenic Guilin"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 4, Jul 80 pp 5-10

ABSTRACT: Guilin of Guangxi is famous for its scenery. In 1958, the municipal committee had concentrated efforts to establish steel, electric power, and cement industries in the scenic region and problems of pollution appeared immediately. From 59-64, 2 meetings were called to discuss these problems, but during the cultural revolution, construction of scenic region was looked upon as service to the capitalist class. Pollution spread rapidly. Half of the crystal clear Lijiang became covered by a yellow-white foam. Fish, birds, grass, and trees died in gigantic quantities. The scenery was destroyed along with agriculture, and the health of the people was in danger. The 18 scenic areas and 45 points of interest of Guilin region are described. The State's Council in document No 11, 1979 formulated plans for restoration and construction of scenic Guilin. The paper presents suggestions for developing the region into a key tourist area. By moving the heavy industry out of the city and its vicinity, hotels and residential dwellings are also to be constructed to restore as well as improve the region's natural beauty.

AUTHOR: PENG Peigen [0774 1981 3010]

ORG: None

TITLE: "Relic Preservation in City Planning"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 4,  
Jul 80 pp 11-13

ABSTRACT: Preservation of relics, including historical remains of the revolution had always been a tradition of the party until the years of LIN Biao, gang of four, who, using their opposition to feudalism, capitalism, and revisionism as the excuse, destroyed relics of history and culture without hesitation. Relic preservation is in reality the establishment of restricted construction areas. Some areas should be preserved and restored absolutely in the original form while other areas, scattered throughout a city in many cases may be protected through controlling the architectural style of buildings surrounding these buildings or areas. Some intended areas of preservation in Chongqing, Shanghai, Beijing, etc. are mentioned.

AUTHOR: PENG Peigen [1756 1014 2704]

ORG: None

TITLE: "Design of Xiangshan Hotel--An Approach to Modern Chinese Architecture"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 4,  
Jul 80 pp 14-19

ABSTRACT: On 18 Jan 80, the author, an architect of Toronto, Canada, came to the New York City office of BEI Yuming [6296 5124 6900] I.M.Pei] at BEI's invitation to discuss the latter's design of Beijing Xiangshan Hotel. In the 43 years since BEI left China, this is the third time he has worked for China (he designed 2 buildings for Taiwan in 62 and 67.) As China is quickening her 4-modernizations, BEI's design also means working side by side with Chinese architects to build a road to future. With this job, he brings his more than 40 years of experience in modern architecture to China in a searching and probing attitude. BEI suggests that Chinese high rises should be entirely Western in style, while low buildings of 3-5 stories may incorporate traditional ideas. A model and ground plans of Xiangshan Hotel are presented, with comments from the author.

NO. 0704 125-1-2

REF: 125

TITLE: "I.H. PEI Talks on Architecture"

SOURCE: Beijing JIANZHU XUNBAO [ARCHITECTURAL JOURNAL] in Chinese No 4, Jul 59 pp 17-21

ABSTRACT: On 21 April 59, I.H. PEI was invited by Beijing Municipal Civil Engineering and Architectural Society to speak to some Chinese architects. The paper is an outline of the speech from notes taken by ZHI Ming [1579 202]. There had not been time to send the copy to Mr. PEI for his review before publication, however. PEI spoke of his trips to almost all major cities of Southeast Asia to view every important work of architecture, which impressed him as blind imitation of the West. Not a single city gives one the feeling of a long historical background. Second and third rate western things are copied, and there is nothing of first rate. Modern architecture has started late in China. This can be an advantage. China can learn a lesson from them to avoid the same mistake. There are many architectural schools in the USA today, and not all are worthy of attention. The most important thing is for China to find her own way to be useful in single houses and large buildings alike. The responsibility of architects is to preserve those things that are closely related to modern living.

AUTHOR: Kenzo Tange

REF: 125

TITLE: "Kenzo Tange on World's Trend of City Development"

SOURCE: Beijing JIANZHU XUNBAO [ARCHITECTURAL JOURNAL] in Chinese No 4, Jul 59 pp 22-27

ABSTRACT: This paper is the outline of a speech delivered by Professor Kenzo Tange, the famous Japanese architect on 12 May at the invitation of Beijing Municipal Civil Engineering and Architectural Society, on problems of cities all over the world. He believes that cities are in perpetual development; therefore, when a city of 2,000,000 people is being planned, consideration must be given to possibilities of further development if the population should grow to 10,000,000. Problems of transportation, telephone, etc. are also important. For relieving the heavy burden of the urban center, he suggests that the center should be changed from a point to a line, such as the case in New York City. Problems of the destruction of the natural environment, harmonizing the new and the old structures, foretelling the ways of living, legal protection of the right to sunlight, to scenery, etc. of the residents of the city, etc. are briefly discussed.

AUTHOR: CHEN Honglin [7112 2830 1787]

ORIG: None

TITLE: "Defending Sloping Roof"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 4, Jul 80 p 23

ABSTRACT: Judging from published papers on architectural works in JIANZHU XUEBAO, all agreed to a death sentence for the traditional sloping roof, which appeared in large quantities during the early years after the liberation. The author believes that unlike political lines, the art of architecture cannot be clearly determined to be right or wrong. Just as any other art form, an architectural design can only be said to be good or bad. Furthermore, those architects who designed those sloping roofs should not be branded as the restoration school. The author believes that those roofs represent attempts to incorporate the national style. As a matter of fact many have praised the roof of the Olympic Swimming Pool in Tokyo, designed by Kenzo Tange. It is in fact a renewal of the sloping roof. The author suggests that all forms should be explored to add variety. Uniform adoption followed by total condemnation of a style, such as the sloping roof, is not in the best interest of growth and development.

AUTHOR: BAI Danna [4101 1795 2021]

ORIG: None

TITLE: "Planning Housing Areas of Metropolis"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 4, Jul 80 pp 24-27

ABSTRACT: Small area regionalization in city planning is based upon the use of ten plus hectare of land to house about 10,000 people. The radius of service of public building cannot be greater than 200-300m. In reality, for example, no more than 700m can be assigned to a much needed outpatient clinic, which is necessarily deficient. An outpatient clinic should have 2,000-3,000m<sup>2</sup> of floor space to serve 40,000-50,000 people. Department stores, grocers, etc. present similar problems. This paper discusses the limitations of the small area arrangement, as a comment on a paper published in the journal previously (No 1, 79.) Using residential areas in Paris, Moscow, etc. as examples, other alternatives are explored, under the condition of modernized transportation in a metropolis.

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TITLE: "Housing Group with Courtyards"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 4,  
Jul 80 pp 29-33

ABSTRACT: In renewal projects in old residential areas of Shanghai, demands for high-rises are increasing in the last several years in an effort to resolve the contradiction of demolishing fewer old buildings to build more new ones. For the purpose of increasing the density, reducing the amount of investment, and improving the residential environment, the paper suggests several designs of high-rise residential housing groups with courtyards. Attention should be given to controlling the scale of the buildings, if a new housing group is to be interposed among old buildings without destroying harmony, however.

APPROX: WANG Shizheng [3076 1353 2582]  
QIAN Lianzhong [6949 1331 1800]

NOTE: None

TITLE: "Design of High-rise Apartments in Shanghai"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 4,  
Jul 80 pp 34-41

ABSTRACT: Since the liberation, about 200,000,000m<sup>2</sup> of workers' residence were built in Shanghai. In the 50's, 2,3,4 story buildings were built, in the 60's, they were 5 stories. In the 70's, most of them were 5-6 stories, while, at the same time some 12-16-story high-rise apartment buildings were also constructed. Based upon a summation and review of the 23 5-16 high-rise apartments already completed in Shanghai, this paper discusses the relationship of site selection and city planning, construction density and land use, construction area per household and added space for elevators etc. Reasonable number of stories and load tolerance of the site, and other related problems.

AUTHOR: WAO Jinhua [6397 259 7507]

ORG: Design Office, Beijing Municipal Architectural Designing Academy

TITLE: "A Model Unit of Housing--A Comprehensive Study"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 4, Jul 80 pp 42-45

ABSTRACT: In Oct 78 after reviewing the Qiansanmen Residential Buildings, DENG Xiaoping pointed out that in the future more consideration should be given to increasing the floor space, adding wash-room for the convenience of the residents, as well as using new light weight construction materials, and reducing height of the ceiling. His comments attracted a great deal of attention. On the basis of his suggestions, a model building for two households was designed, with the ceiling reduced from the original 2.9m to 2.7m. The money saved from the reduction of ceiling height was spent to add 2m<sup>2</sup> of floor space to each household. The model unit is also equipped with a bathroom and a kitchen. Effective use of space and reasonable arrangement of lighting and ventilation are featured. Problems encountered in the designing, construction, and demonstration process are discussed.

AUTHOR: YAN Wenwu [7346 2429 2976]  
ZHANG Qinglyu [1728 1987 7047]

ORG: Both of Shanghai Municipal Bureau of Park Management

TITLE: "Display Center of Gardening, Hongkou Park, Shanghai"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 4, Jul 80 pp 58-60

ABSTRACT: In order to enrich park activities, a new museum building was constructed in Hongkou Park. The design calls for the building to be used mainly for displaying flowers and potted plants, but it also has space to show paintings, books, handicraft art, etc. There are also small conference rooms, reading rooms, etc. Hongkou is a memorial public park built in honor of LU Xun. The building is, therefore, named Yiwu, 2 characters taken from the journal Yiwu Yinghua, edited by LU Xun. A description of the design, the horizontal arrangement of the structure, and several photos of the museum are included.

ARTICLE 1951

CONF: None

TITLE: "Scientific Activities"

SOURCE: Beijing JIANZHU XUEBAO [ARCHITECTURAL JOURNAL] in Chinese No 4, Jul 60 pp 61-63

ABSTRACT: Four short items are included. (1) By invitation of China Architectural Society, a group of 15 delegates of the China Research Team of foreign architects came to China on 6-27 Apr to visit cities of Shanghai, Beijing, Suzhou, Qufu, Tai'an, Baotou, etc. and to carry out scientific exchanges. (2) By invitation of China Architectural Society, 3 Canadian city planner and architects came to visit Nanjing, Beijing, and Changsha from 14 to 25 Apr. The Chinese Canadian architect, FENG Peigen [1756-1814-1704] was one of them. The group brought more than 500 slides with them to introduce the conditions of urban renewal, planning of new cities, arrangement of housing areas, residential buildings, preservation of ancient structures, construction of scenic areas, construction of athletic stadiums, etc. in foreign countries. (3) In the 10 years of outrage of LIN Biao and gang of four, many ancient structures were destroyed. Now, the condition is more favorable, but some destruction of historical relics still continue to occur, now and then. A symposium was called by China Architectural Society in Beijing to discuss this problem. (4) A Second Metropolis Transportation Planning Discussion Meeting was held under the joint auspices of the City Planning Committee of China Architectural Society, Beijing Municipal Bureau of Planning, Shanghai Municipal Academy of Planning and Designing, etc. Proposals at the meeting included reconstructing the existing crossroads, developing automatic traffic light system, improving public transportation to reduce the increase of number of bicycles, building walk bridges and tunnels in commercial centers of cities, etc.

NOTE

NO: 4009

AUTHOR: YANG ZILONG [0701 4400 2000]

ORG: Institute of Computing Technology, Chinese Academy of Sciences

TITLE: "LBLR(K) Grammar and Grammatical Decomposition"

JOURCE: JIJIANG JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese  
Vol 3 No 1, 1980 pp 1-13

TEXT OF ENGLISH ABSTRACT: In this paper a kind of two level grammar is introduced. It is the theoretical basis of a parser generator XYZ/PG we have constructed. We consider the top-down recursive descent method to have the drawback of dividing modules too small, but the bottom-up parser is in one block and thus has the drawback of the opposite case. Both lead to unreadability and dismodifiability. In §2, we introduce a method to decompose a grammar naturally into a group of subgrammars which are connected together in a top-down way. This lattice theoretic structure constitutes the outer syntax of the two level grammar, whereas each subgrammar in it is a bottom-up LR-like grammar which we call LBLR(k) and constitutes the inner syntax. To combine the top-down method with the bottom-up in this way can improve readability and modifiability of the parser immensely.

[Continuation of JIJIANG JISUANJI XUEBAO Vol 3 No 1, 1980 pp 1-13]

In §3 we discuss LBLR(K) in detail. This is a refinement of the BLR(K) grammar introduced in an earlier paper. The optimizing method of state-merging discussed in the earlier paper is still completely applicable to LBLR(K), but the restrictive condition, the so-called bottom-up condition, proposed there has been relinquished. It has been proved that instead of this condition the apparent "conflicts" possibly occurring after state-merging can be avoided by locking backward only one symbol behind the leftmost merged state in the stack. Consequently LBLR(K) is a grammar as large as the one with which the merging method starts and which can be either SLR(K) or LALR(K).

SYNOPSIS: [5516 7291 5019]

ORG: Institute of Mathematics, Chinese Academy of Sciences

TITLE: "BLR(K) Grammar and FFL Production"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese  
Vol 3 No 1, 1980 pp 16-32

TEXT OF ENGLISH ABSTRACT: BLR(K) GRAMMAR is a kind of grammar belonging to the LR family from which a concise Floyd Evans production program can be mechanically generated. In this paper the conditions for the BLR(K) grammar are given which are both necessary and satisfactory. It is also shown that the BLR(K) grammar properly includes the weak precedence grammar.

AUTHOR: DONG Yumei [5516 7291 5019]

ORG: Institute of Computing Technology, Chinese Academy of Sciences

TITLE: "An Experimental System for Generating High Quality Chinese Characters"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese  
Vol 3 No 1, 1980 pp 33-37

TEXT OF ENGLISH ABSTRACT: This article introduces a method and the related software system for generating high quality Chinese characters, which can be used to design and output Chinese characters and their symbols of various forms.

AUTHOR: AO Zhicheng [7118 1807 20-2]

ORG: Computing Station of Oil Refining Design Institute, Luoyang

TITLE: "Combinational Theory of Compilers"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese  
Vol 3 No 1, 1980 pp 38-53

TEXT OF ENGLISH ABSTRACT: In this paper a combinational theory of compilers is described and a formal deductive system is given. We have obtained two basic theorems. One is an algorithm which can combine all new compilers as some compilers are given. The other is also an algorithm which can combine those compilers which are just expected when some compilers are given. Finally, concepts such as ordinary compiling, self-compiling, bootstrap structure, macro structure and hierarchical structure are discussed with the formal deductive system given in this paper.

AUTHOR: YANG Shiren [2799 0013 0088]

ORG: Institute of Remote Sensing Applications, Space Science and Technology Center, Chinese Academy of Sciences

TITLE: "Geometric Transformation and Data Organization in Digital Image Processing"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese  
Vol 3 No 1, 1980 pp 54-66

TEXT OF ENGLISH ABSTRACT: In this paper the algorithms for geometric transformation of image data and the decomposition of the image matrix into submatrices are introduced. When the image is digitized in the line scanning mode, the geometric transformation of the two dimensional image matrix can be realized by two one-dimensional geometric transformations, i.e., first carrying out the geometric transformation along the scanning lines and then rotating the image matrix through 90 degrees and carrying out the geometric transformation in the other direction. These algorithms can be implemented in a minicomputer system with an appropriate software and a special-purpose hardwired device, so that it can reduce the computing time effectively and is adaptable in minicomputer digital image processing systems.

AUTHOR: WANG Xuequn [1769 5887 0674]

ORG: Institute of Computing Technology, Chinese Academy of Sciences

TITLE: "Some Probability Model Methods for Pipeline Computer Performance Analysis"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese  
Vol 3 No 1, 1980 pp 67-76

TEXT OF ENGLISH ABSTRACT: The conception of instruction state jump probability is presented in this paper. It is an extension of the concept of instruction mix, and can be used to analyze the performance of pipeline computer systems. Based on this idea, an approximate method of sequence analysis is introduced to estimate effects of overlapping and parallel execution of instructions.

In order to estimate how the storage subsystem parameters influence the system performance, the address flow is simulated by random number sequence. An equal probability model is established to analyze the dispatching time of main memory and disc storage, and the distribution of the access time demanded by instruction flow and of the access time provided for data flow are presented.

AUTHOR: CHEN Dayou [7115 1129 2589]

ORG: Institute of Computing Technology, Chinese Academy of Sciences

TITLE: "Two Methods of High-Speed Decoding of Fire Codes for Disc Error-Correction"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese  
Vol 3 No 1, 1980 pp 77-87

TEXT OF ENGLISH ABSTRACT: In this paper two methods of high-speed decoding of fire codes for disc error-correction are presented.

Method I. For determination of erroneous address, high-speed backward shift circuits are used to perform the cyclic shift of  $P(x)$ . The maximum number of times of shifting operation for the decoding with a code length  $N$  is less than  $(e + N/c)$ . The erroneous address will be given directly by the counter.

Method II. On the basis of the Chinese remainder theorem, the erroneous address will be given directly by the counter when  $P(x)$  and  $c$  are properly chosen. The maximum number of times of decoding shift is less than  $(e + c)$ .

Both methods are suitable for high-speed decoding in the disc storage system where arithmetic operation functions are not available and the zero-filling operation is not necessary. They are also suitable for arbitrary code length.

AUTHOR: ZHANG Guangming [1728 0342 2494]  
SHI Suwen [0670 4790 2429]

ORG: Both of the Institute of Computing Technology, Chinese Academy of Sciences

TITLE: "Highly Reliable Voltage Stabilizer for Power System of Large-Scale Computer--Principle and Application of Negative Compensation"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese  
Vol 3 No 1, 1980 pp 88-95

TEXT OF ENGLISH ABSTRACT: Highly reliable, miniature-sized power systems with large capacity are required in modern electronic equipment. In this paper, a simple scheme based on the "principle of negative compensation" is proposed. It meets all the requirements of large-scale electronic devices, especially of large-scale computers with medium frequency motor-generator sets in their power systems. The principle of negative compensation is briefly described and experimental results are presented. Finally, various types of power supplies are compared.

AUTHOR: LIU Xuhua [0491 0650 5478]

ORG: Jilin University

TITLE: "Generalized FUZZY Logic and Lock Semantic Resolution Principle"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese  
Vol 3 No 2, 1980 pp 97-111

TEXT OF ENGLISH ABSTRACT: In 1971 and 1972, R. C. T. Lee and C. L. Chang studied some properties of FUZZY logic in which truth-values are adopted above  $[0, 1]$  interval (we call this logic a special FUZZY logic). They proved that formula G is unsatisfiable in two-valued logic if and only if G is unsatisfiable in special FUZZY logic and they also proved that the resolution principle put forward by Robison in 1965 is complete in special FUZZY logic.

The author has proved in another paper that the lock semantic resolution principle, IDI-resolution and LI-resolution, are complete in special FUZZY logic.

The FUZZY logic in which the propositional truth-values are adopted on lattice (we call this logic a generalized FUZZY logic) is a logic closer to man's ideology.

[Continuation of JISUANJI XUEBAO Vol 3 No 2, 1980 pp 97-111]

This paper proves that formula  $G$  is unsatisfiable in two-valued logic if and only if  $G$  is unsatisfiable in generalized FUZZY logic and that the original resolution principle and IDI-resolution, LI-resolution principle are complete in generalized FUZZY logic.

AUTHOR: GREN Huowang [7113 3499 2489]

ORG: Changsha Institute of Technology

TITLE: "The Decision Problem of Families of General Recursive Functions"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese Vol 3 No 2, 1980 pp 112-118

TEXT OF ENGLISH ABSTRACT: The characters of recursive solvability of families of general recursive functions are described. The main conclusions include: (1) A necessary and sufficient condition that a family  $A(\subseteq R)$  be semi-recursive is that there exists a family  $0 \in D^0$  such that  $\eta 0$  is r.e., and  $A = K_R(0)$ . (2) A family  $A(\subseteq R)$  is recursive iff both  $A$  and  $\bar{A}$  are semi-recursive. (3) A family  $A(\subseteq R)$  is recursive iff there exist two disjoint  $0_0, 0_1 \subseteq D^0$  such that both  $\eta 0_0$  and  $\eta 0_1$  are r.e., and  $A = K_R(0_0)$ ,  $\bar{A} = K_R(0_1)$ .

AUTHOR: SUN Zhongxin [1527 6988 4421]

ORG: Nanjing University

TITLE: "Processes and Their Synchronizing Operations"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese  
Vol 3 No 2, 1980 pp 119-131

TEXT OF ENGLISH ABSTRACT: This paper gives a definition of processes and describes the concept of synchronizing mechanisms. Several synchronizing mechanisms are discussed and it is proved that they are logically equivalent.

AUTHOR: ZHOU Longxiang [0719 7893 7534]

ORG: Institute of Mathematics, Chinese Academy of Sciences

TITLE: "The Loading and Retrieving of the Structures for Database Management Language SKGY Implementation"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese  
Vol 3 No 2, 1980 pp 132-142

TEXT OF ENGLISH ABSTRACT: This paper describes the implementation algorithms of database management language SKGY, with special emphasis on the loading and retrieving of the structures for SKGY.

SKGY is a self-contained language designed for minicomputers, its retrieval function is designed by query language, and its data structure is a hierarchical structure. The SKGY is implemented by the interpreter using system assemble language XHY, which is machine-independent. The primitive system is implemented on a DJS-21 computer. As XHY is transported to other computers, so is this system.

AUTHOR: XU Yanren [1776 4242 0086]  
ZHU Chuangli [2612 0278 3825]  
FANG Zhixi [2455 0037 3356]

ORG: All of Pudan University

TITLE: "A Scheme of Parallel or Interleaved Memory Consisting of Prime Module Memories"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese  
Vol 3 No 2, 1980 pp 143-150

TEXT OF ENGLISH ABSTRACT: In this paper the relationship between memory contention and the number of the modules in a parallel or interleaved memory generally used in a multiprocessor system is analyzed and mathematical models of efficient memory bandwidth for  $2^n$  module and prime module are set up respectively. Finally, two hardware schemes of address transformation for the specific prime ( $2^n \pm 1$ ) module are described.

AUTHOR: NI Guangnan [0242 0342 0589]  
DING Jiafu [0002 1367 4395]  
GAO Zhongcao [7559 0112 2347]  
LIU Jinduo [0491 6855 6993]

ORG: All of the Institute of Computing Technology, Chinese Academy of Sciences

TITLE: "A Handprinted OCR"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese  
Vol 3 No 2, 1980 pp 151-164

TEXT OF ENGLISH ABSTRACT: A handprinted character reader (OCR) is described. It is equipped with some adaptive circuits including a scanner capable of performing two-dimensional affineTransform, an automatic beam focusing circuit, etc. For effective extracting of the local as well as global features of characters, a kind of structural method of recognition is developed. In addition, an algorithm for automatic generation of the character dictionary by learning process is implemented.

The characters being read include numerals, alphabets and symbols (total 62).

[Continuation of JISUANJI XUEBAO Vol 3 No 2, 1980 pp 151-164]

The accuracy of recognition is comparable with other handprinted OCR, but the constraints imposed on writing and on document format are fewer. This OCR is designed as an input device for reading handwritten data and programs.

AUTHOR: ZHENG Qilun [6774 0796 0243]  
WU Guorong [0124 0948 2837]

ORG: Both of Huanan Institute of Technology

TITLE: "Properties and Theorems of Graphs of Three-Dimensional Array Cell Structures"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese  
Vol 3 No 2, 1980 pp 165-171

TEXT OF ENGLISH ABSTRACT: In this paper the algorithms of graphs of three-dimensional array are studied and several properties and theorems are demonstrated. All kinds of paths of cell structures of arbitrary finite  $k^3$  array could be automatically analyzed by these properties and theorems.

AUTHOR: LIU Shengpan [0491 1957 2938]  
GUO Yuchai [6753 3768 6863]

ORG: Both of the Institute of Computing Technology, Chinese Academy of Sciences

TITLE: "CJDX--An Automatic Routing System for Multilayer Printed Boards"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese  
Vol 3 No 2, 1980 pp 172-181

TEXT OF ENGLISH ABSTRACT: CJDX is an automatic routing system for multilayer printed boards which has been implemented on the computer QJ. It uses Lee's algorithm and incorporates the experience of manual routing. It reasonably determines the interconnecting set of wire, assigns wires to layers, defines the order of wire layout, and uses feedthrough holes and obstacle walls so that it can increase the routing efficiency and save the computer time.

This system possesses satisfactory capability for wire routing. According to the information of interconnection in logic diagram, this system automatically realizes the wire routing. The result can be punched out on paper tape by a puncher. By putting the punched tape on a photographic plotting device SK-1, the user can obtain the artwork masters for printed wiring board fabrication.

AUTHOR: ZHANG Mian [4545 4875]  
QU Yanwen [1448 1693 2429]

ORG: ZHANG of Harbin Institute of Technology; QU of Huabei Institute of Computing Technology

TITLE: "The Multiple-Variables Boolean Difference and the Theorem of Sensitizing Multiple Paths"

SOURCE: Beijing JISUANJI XUEBAO [CHINESE JOURNAL OF COMPUTERS] in Chinese  
Vol 3 No 2, 1980 pp 182-190

TEXT OF ENGLISH ABSTRACT: Up to now, no effective method has been used to evaluate the Boolean difference for circuits with reconvergent fanout. This greatly impedes the application of the algorithm of Boolean difference to fault-diagnosis test generation.

The theorem of sensitizing multipaths given in this paper is an effective formula for evaluating the Boolean difference. With the help of this theorem the algorithm of Boolean difference can be made more efficient and some of the computer memory space will be saved.

AUTHOR: Lu Yan [0063 7346]

ORG: None

TITLE: "An Unusual Atmospheric Waveguide"

SOURCE: Beijing DIANZI SHIJIE [ELECTRONICS WORLD] in Chinese No 3, 1980  
p 5

ABSTRACT: Under certain conditions, the atmosphere can form a "waveguide" by which microwave radar beams can travel in a path following the curvature of the earth rather than being limited to line-of-sight propagation. Particularly in the case of temperature inversions with an increase of humidity with altitude in the troposphere, the atmosphere's refractive index for very short wavelengths increases with altitude, so that waves emitted from the ground are curved back to the ground, from which they are reflected, then refracted again, making several skips before they are reflected back to the radar station. In some areas these conditions persist for long periods. In some locations in the Indian Ocean, for example, a station can have a radar range of 350 km, or up to 1,200 km, when the normal line-of-sight range would be 35 km. The phenomenon is very useful for detecting lower-atmosphere objects such as aircraft.

AUTHOR: FANG Fang [5364 5364]

ORG: None

TITLE: "Basic Logic Circuits For Operations with 0 and 1"

SOURCE: Beijing DIANZI SHIJIE [ELECTRONICS WORLD] in Chinese No 3, 1980  
pp 13, 15

ABSTRACT: The three logical operations of addition (OR), multiplication (AND) and negation (NOT) are introduced and their truth tables and Boolean representations given. Simple circuits for all three operations are presented, the AND and OR circuits using diodes and the NOT circuit using a triode.

AUTHOR: YU Renzhong [0735 0088 5168]

ORG: None

TITLE: "Television Set Reliability"

SOURCE: Beijing DIANZI SHIJIE [ELECTRONICS WORLD] in Chinese No 3, 1980  
pp 14-15

ABSTRACT: Reliability theory was developed in the years following the Second World War, primarily for military applications, but quickly spread to consumer applications as well. Reliability is different from stability. The former is a function of design, whereas reliability is a function of the manufacturing process and components. Reliability can be expressed in terms of probability of failure in a given period or in terms of average time to failure. For television sets, reliability can be described in terms of three periods: the initial period, extending through the first 1-3 months of use, in which the main causes of malfunctions are inadequate quality control at the factory, mistreatment during storage and transportation, misuse by the consumer or early failure of parts; the random failure period, in which the likelihood of failure is not great; and the deterioration period, when deterioration of transistors and picture tube begins to appear. Suggestions for avoiding damage to television sets in the home are given.

AUTHOR: None

ORG: None

TITLE: "Innovations and Applications"

SOURCE: Beijing DIANZI SHIJIE [ELECTRONICS WORLD] in Chinese No 3, 1980  
pp 24-25

ABSTRACT: The following developments are described: (1) improvements in the triggering method of a single-phase bridge-type semiconductor-controlled rectifier circuit; (2) a simple silicon controlled rectifier switching circuit which makes it possible to adjust a 220 volt AC source from 40 to 220 volts or produce an output of 20 to 110 volts DC; (3) an SCR-controlled voltage regulator circuit for slide projectors; (4) a circuit for a switch which is operated by contact rather than pressure.

AUTHOR: None

ORG: None

TITLE: None

SOURCE: Beijing DIANZI SHIJIE [ELECTRONICS WORLD] in Chinese No 3, 1980  
front cover

ABSTRACT: A television set for direct reception of satellite transmission has been experimentally developed by the Nanjing Institute of Solid State Components. It uses a portable small-aperture dish antenna, a high frequency stage mounted behind the antenna and a medium frequency demodulator placed below the set. High-quality solid state microwave components are used. The photograph shows a Chinese family watching such a set, with the dish antenna (bearing the letters NSR) installed on the balcony of their apartment.

AUTHOR: None

ORG: None

TITLE: "Fifth Annual Computer Conference Held in Kunming"

SOURCE: Beijing DIANZI SHIJIE [ELECTRONICS WORLD] in Chinese No 4, 1980  
p 1

ABSTRACT: The computer division of the China Electronics Society held its fifth annual meeting in Kunming on 12-26 December 1979. Some 377 representatives of 221 organizations were present. A total of 327 papers were received, of which 147 were given at the conference. A special discussion of how to speed up computer development in China was held. Methods of popularizing computer knowledge were discussed.

AUTHOR: None

ORG: None

TITLE: "The Communications Age Is Arriving: Looking Ahead to the Combination of Computers and Communications"

SOURCE: Beijing DIANZI SHIJIE [ELECTRONICS WORLD] in Chinese No 4, 1980 pp 2-4

ABSTRACT: With the advent of computers, communications has been expanded to include not only man-man communications, but man-machine and machine-machine communications as well. This has depended, among other things, on the introduction of digital communications. At the same time, computer systems have developed: the first computers were self-contained "point" computers; in the late 1960's these were replaced by "line" computers, in which compatible devices belonging to the same family were connected by communication lines; in the 1970's, the development of "distributed processing systems" has produced "area" computers. The computer-communications combination will provide information sources for individuals, social and business uses and administration.

AUTHOR: None

ORG: None

TITLE: "Our Country's Large-Scale Integrated Circuits Go Into Production"

SOURCE: Beijing DIANZI SHIJIE [ELECTRONICS WORLD] in Chinese No 4, 1980 p 4

ABSTRACT: The Fourth Ministry of Machine Building held a conference on accelerating the putting into production of large-scale integrated circuits from 25 to 28 December 1979 in Peking. Domestic and foreign research results, technical policy and specific requirements for putting LSI circuits into production were discussed and plans for going into production in 1980 and 1981 were decided upon. Deputy Premier Wang Zhen [2769 7201] stressed activism, rapid development of the electronics industry, a policy toward intellectuals, fostering a creative spirit, mastery of materials, processes and quality, and expansion of applications in rapid development of an LSI production capability.

AUTHOR: None

ORG: None

TITLE: "An Electronic Electric Fence Unit"

SOURCE: Beijing DIANZI SHIJIE [ELECTRONICS WORLD] in Chinese No 4, 1980  
p 22

ABSTRACT: The Chengdu No 3 Electronics Plant manufactures the DMQ-5 AC or DC electric fence power unit. This is powered by solar cells, and is accordingly suitable for use in prairie and mountain regions. When DC power is used, the device can activate a fence to a distance of 20 km (single wire), and when DC power is used, the distance is up to 40 km. It emits pulses which can reach 1600 V at the end of a 500 ohm load; the pulse repetition rate is 57 per minute.

AUTHOR: None

ORG: None

TITLE: "A Unitized Line Output Transformer"

SOURCE: Beijing DIANZI SHIJIE [ELECTRONICS WORLD] in Chinese No 4, 1980  
p 23

ABSTRACT: The Suchou Television Components Plant has improved upon its line output transformer which won a top quality rating in 1979 by unitizing it. The high voltage package, low voltage package and core are all sealed with epoxy resin into a plastic package, increasing the temperature resistance of from 50° to 100° C and improving the temperature resistance of the entire television set. It is also humidity and vibration resistant, stable in operation and easy to install.

AUTHOR: None

ORG: None

TITLE: "An External Detector for Metal Contraceptive Loops"

SOURCE: Beijing DIANZI SHIJIE [ELECTRONICS WORLD] in Chinese No 4, 1980  
p 23

ABSTRACT: The Tuojiang [3108 3068] No 1 Radio Plant, Neijiang, Sichuan, produces the THQ-2 external metal contraceptive loop detector, which can be used to determine externally whether a contraceptive loop is in the uterus. The device measures 230 x 160 x 120 mm and weighs 2.1 kg. It is sensitive, stable, easy to operate, and portable, with battery power, and is suitable for rural use. It has received good reviews in field tests.

AUTHOR: None

ORG: None

TITLE: "National Semiconductor Integrated Circuit and Silicon Materials Conference Held in Fuzhou"

SOURCE: Beijing DIANZI SHIJIE [ELECTRONICS WORLD] in Chinese No 5, 1980  
p 1

ABSTRACT: The Semiconductor and Integrated Circuit Technology and the Electronics Materials societies of the China Electronics Society jointly held a conference on integrated circuits and silicon materials from 29 December 1979 to 6 January 1980 in Fuzhou. Some 500 persons attended. A total of 250 articles were received and excerpts of them published. Experts of the middle generation predominated at the conferences. The Fujian Province Scientific and Technical Committee discussed with the conference participants how to develop Fujian's electronics industry.

AUTHOR: TONG Yin [2717 7299]

ORG: None

TITLE: "Low-Altitude Radar: The Key to Construction of Modern Air Defense Systems"

SOURCE: Beijing DIANZI SHIJIE [ELECTRONICS WORLD] in Chinese No 5, 1980  
pp 2-4

ABSTRACT: Experience in Vietnam and the Middle East indicates that extremely low altitude bombing (from 1,000 meters down to 30 meters) will become increasingly important. This means of attack is difficult to defend against because aircraft can take advantage of radar blind spots and ground interference. Circuits have been developed to help separate the useful signal from the interference: instantaneous automatic gain control circuits work on a different part of the gain curve to prevent overload; time automatic gain control circuits work in terms of the pulse repetition rate of the radar to control the gain; and active target selection devices filter out signals from stationary objects. For best protection, an overlapping radar network is set up, choosing terrain locations with care. Then the terrain reflection parameters and signal parameters from aircraft with known course and velocity can be determined to aid in processing information on real targets. Future

[continuation of DIANZI SHIJIE No 3, 1980 pp 2-4]

developments may include over-the-horizon detection based on the shock waves from supersonic aircraft, detection of aircraft interaction with the earth's magnetic field, satellite-borne infrared detectors to sense exhaust gases, and radio reflection from the ionosphere. Currently radar systems are mounted on dirigibles and patrol aircraft (e.g. the AWACS); the latter can provide a coverage 50 times as great as ground-based radar and carries computer equipment for signal processing. These aircraft patrol a perimeter and guide interceptors to the target. In addition, fast-reacting semiautomatic air defense installations are useful, particularly in mountain areas.

AUTHOR: None

ORG: None

TITLE: "Brief Information on Examinations Offered for Prospective Higher Education Students by the Fourth Ministry of Machine Building in 1980"

SOURCE: Beijing DIANZI SHIJIE [ELECTRONICS WORLD] in Chinese No 5, 1980 p 10

ABSTRACT: The Chengdu Electronic Communications Engineering Academy invites applicants in 17 cities and provinces to test for admission in 13 fields including electromagnetic field engineering, solid state components, specialized radio equipment, automatic control, laser technology, vacuum electronics, electrical engineering, computer engineering, applied mathematics and the like. The Northwest Academy of Electronic Communications Engineering (Xi'an) invites applicants in 25 provinces and cities to test for admission in 15 fields including radio communications, signal theory, radar engineering, radar signal processing, electronic countermeasures, computer science, remote control and telemetry, precision electronic apparatus, semiconductor physics, laser technology, IR technology, microwave technology. The Guilin Academy of the Electronic Industry invites applicants in 15 provinces and cities to apply in electronics engineering. The Hangzhou Academy of Electronics

[continuation of DIANZI SHIJIE No 5, 1980 p 10]

Engineering invites applicants in 12 provinces and cities to apply in electronics engineering financial calculations, radio technology, radio equipment production, computer applications and electronics industry enterprise management.

AUTHOR: None

ORG: None

TITLE: "Mine Induction Communications"

SOURCE: Beijing DIANZI SHIJIE [ELECTRONICS WORLD] in Chinese No 5, 1980  
p 17

ABSTRACT: Inductive communication is a method of communications which uses the electromagnetic inductance and static coupling between a communication cable called an "induction line" and a mobile unit. The principle was first discovered in 1948 in England but was first widely used only in the 1960's. The method is useful in mines because it enables rescue teams and the like to communicate while on the move; radio communication is not possible underground. The best frequency range is between 10 and 250 kHz.

AUTHOR: None

ORG: None

TITLE: "Innovation and Applications"

SOURCE: Beijing DIANZI SHIJIE [ELECTRONICS WORLD] in Chinese No 5, 1980  
pp 23-28

ABSTRACT: The following developments are described: (1) an industrial time sequence controller; (2) a light-controlled switch; (3) a device for locating acupuncture points by their lower resistance than the surrounding skin; (4) a high-frequency seed treatment device; (5) a laser device used in breeding seed varieties; (6) a method of converting a five-channel tube television into a 12-channel set; (7) a circuit for an electrical cradle rocking device.

AUTHOR: None

ORG: None

TITLE: None

SOURCE: Beijing DIANZI SHIJIIE [ELECTRONICS WORLD] in Chinese No 5, 1980  
front cover

ABSTRACT: Peking Plant No 1201 has imported a state-of-the-art electronic color separator which displays directly on a color screen the results of color printing. It uses laser technology and has the advantages of high speed, high definition and high sensitivity. The cover photograph shows the device in operation.

AUTHOR: Li He [6849 4421]

ORG: None

TITLE: "Digital Signal Processing"

SOURCE: Beijing DIANZI SHIJIIE [ELECTRONICS WORLD] in Chinese No 6, 1980  
pp 2-4

ANSTRACT: Signals are digitized by means of an analog-digital converter which measures the signal amplitude at specific time intervals and assigns it an integral value which then can be transmitted by digital equipment. The signal can be reconstituted by a digital-analog converter. Human voice signals can be analyzed and transmitted in this way, which increases the capacity of communications channels. Using the technique, computers may be programmed to recognize spoken commands. Digitized radar or sonar signals can be subjected to fast Fourier transform processing to distinguish the useful signal from static interference. Digitized seismic information can be used in detection of earthquakes and in seismic prospecting. In digital image processing, the digitized form of an image scan can be processed to improve definition, restore lost information and recognize features.

AUTHOR: None

ORG: None

TITLE: "Direct Reception of Satellite Television Programs"

SOURCE: Beijing DIANZI SHIJIE [ELECTRONICS WORLD] in Chinese No 6, 1980  
pp 6-7

ABSTRACT: Satellite television transmission has the advantage over ground-based transmission that it can cover an extremely broad area, while ground based television is limited to a relatively short range. It offers particularly great advantages to China. Satellite transmissions are in the 12 gigahertz range and use stationary satellites at an altitude of 35,800 km. Because of the very high frequencies involved, the frequency modulated signal is demodulated in two stages, which requires that the circuitry have very good noise elimination characteristics. A block diagram of the system is given. Reception antennas range in size from individual dishes 0.6-0.8 m in diameter to communal dishes 3-5 m in diameter. Since currently most of China's television stations are located in the coastal area, the introduction of satellite transmission will mean a great expansion in television applications.

AUTHOR: None

ORG: None

TITLE: "'Electronic Eyes' on the Body"

SOURCE: Beijing DIANZI SHIJIE [ELECTRONICS WORLD] in Chinese No 6, 1980  
pp 8-9

ABSTRACT: Some children can recognize shapes and colors at certain points on the skin: at the armpits, ears, back of the knee, top of the head, nose and the like. From 4 to 10 April 1980 a "Scientific Symposium on Anomalous Capabilities of the Body" was held in Shanghai, at which 14 children and youth demonstrated such capabilities. Characters could sometimes be recognized even when distorted or fragmented or sealed in paper envelopes. Experiments at Peking University between October and December 1979 indicate that the capability can be trained. Persons with the capability seem to emit a kind of radiation from the skin which when reflected enables them to recognize patterns. Some persons can even decode holographic interference patterns. The phenomenon seems to be closely connected with the nervous system and with breathing exercises.

AUTHOR: None

ORG: None

TITLE: "Satellite Carrier Rockets"

SOURCE: Beijing DIANZI SHIJIE [ELECTRONICS WORLD] in Chinese No 6, 1980  
p 9

ANSTRACT: The lifting capacity of satellite carrying rockets has increased immensely from the time of the Scout-D, which was capable of putting only a 200 kg payload into a 300 km orbit and was incapable of putting an object into synchronous orbit; capabilities progressed through the Delta-3914, Centaur and Atlas III-C to the carrier rocket for the Space Shuttle, which can put 30,000 kg into a 300 km orbit and 4,000 kg into a 36,000 km orbit.

AUTHOR: None

ORG: None

TITLE: "A Device for Determining Moisture Content, Temperature and Insect Damage in Grain"

SOURCE: Beijing DIANZI SHIJIE [ELECTRONICS WORLD] in Chinese No 6, 1980  
p 27

ABSTRACT: Staff and workers of the Yaxiling Grain Management Office, Yichang County, Hubei Province, have developed an instrument for making the "three determinations" of grain water content, temperature and insect damage, which has greatly decreased physical labor. Previously the "three determinations" had to be made for every million jin of grain and took more than 6 hours of work in the granary, while at present the determination can be made from the operator's cabin in 5 minutes.

AUTHOR: None

ORG: None

TITLE: "Grades and Main Parameters of Audio Amplifiers Produced in This Country"

SOURCE: Beijing DIANZI SHIJIE [ELECTRONICS WORLD] in Chinese No 6, 1980  
inside back cover, p 32

ABSTRACT: Audio amplifiers produced in China are classified in four grades on the basis of 13 basic parameters and a group of technical specifications. Tables show the standards for the four amplifier grades and the technical specifications (input and output voltage, power, load and the like) of the main amplifier series.

AUTHOR: BAO Ziwei [0545 4793 5633]

ORG: None

TITLE: "An Active Member of the World of Electronics: Speech Communications"

SOURCE: Beijing DIANZI SHIJIE [ELECTRONICS WORLD] in Chinese No 7, 1980  
pp 2-3

ABSTRACT: Electronic speech processing began to develop rapidly in the 1960's. Speech can be analyzed in a three-dimensional coordinate system (intensity, frequency, time), giving a visual representation of syllables ("visible speech"). Visible speech or other representations can in turn be used to synthesize speech, which is useful not only in civilian applications but also for military secrecy: speech can be analyzed, scrambled, unscrambled, and resynthesized. Computers can be programmed for speech recognition. In simple cases, individual words can be recognized, but sophisticated machines can recognize whole utterances. The author has seen such devices at the Jet Propulsion Laboratory and IBM. Computers can also be used to recognize the characteristics of individual speech, which is useful for identification.

AUTHOR: WU Yan [2976 1750]

ORG: None

TITLE: "Electronic Warfare at Optical Frequencies"

SOURCE: Beijing DIANZI SHIJIE [ELECTRONICS WORLD] in Chinese No 7, 1980  
pp 6-7

ABSTRACT: Uses of the optical frequencies in warfare include optical reconnaissance, of which the highest-resolution type is in the visible region, but is supplemented by infrared reconnaissance at night; optical warning systems, particularly satellite-borne infrared systems to detect rocket launches by the heat from the exhaust, and laser detection systems which detect laser-guided weapons. Targets can be rendered more secure by decreasing the radiation they reflect or emit; camouflage does this for the visible spectrum, and low infrared emissivity and infrared absorbing paints can be used to prevent IR detection. In addition, exhaust gases can be cooled by mixing with ambient air. Decoys and screening are also important countermeasures: such simple devices as fires can decoy heat-seeking missiles away from their real targets, while a smoke cloud can make it impossible for missiles to home on a target.

AUTHOR: DENG Yunyue [6772 3619 1971]

ORG: None

TITLE: "Laser Guidance Technology"

SOURCE: Beijing DIANZI SHIJIE [ELECTRONICS WORLD] in Chinese No 7, 1980  
pp 8-9

ABSTRACT: Rocket guidance systems have included wire guidance, radar guidance, infrared guidance, television guidance and laser guidance. The last of these is a highly sophisticated technology, but it has the disadvantage of being disrupted by clouds, fog and dust. Work on laser guidance began in earnest in the 1960's. On 12 May 1972 a US laser-guided "smart bomb" destroyed a bridge in North Vietnam which massive bombing raids had been unable to knock out. As of 1975 the US military has many laser-guided missiles such as TOW, DRAGON, BULLDOG, BULLPUP, and the Copperhead projectile. Sweden and Switzerland have jointly developed the RBS-70 short-range antiaircraft system. Laser guidance systems are active, semicative and passive; the semiactive type is currently most prevalent. China is working on laser guidance systems.

AUTHOR: None

ORG: None

TITLE: "Wuxi Building Plant to Produce Color Television Integrated Circuits"

SOURCE: Beijing DIANZI SHIJIE [ELECTRONICS WORLD] in Chinese No 7, 1980  
p 10

ABSTRACT. Wuxi City, Jiangsu Province, is currently building a plant which will produce wired integrated circuits for color television. Its output will be 26 million circuits a year, sufficient to equip 4 million television sets. The technology and equipment are begin provided by the Japanese Toshiba company.

AUTHOR: None

ORG: None

TITLE: "Nationwide Test Use of the 'Method of Adding an Identifier to the Designations of 31-cm Black-and-White Television Sets'"

SOURCE: Beijing DIANZI SHIJIE [ELECTRONICS WORLD] in Chinese No 7, 1980  
p 19

ABSTRACT: Currently both imported and domestically-produced picture tubes are used in 31-cm black-and-white television sets. Starting on 1 June 1980, a designator will be added to the model numbers of these sets to indicate which type of picture tube is used. The letters A, B, C and D indicate imported tubes with different length-to-width ratios and voltages, and the letter G indicates domestically-produced model. Examples are given of addition of the designator to the model numbers of Mudan, Jinxing, Xinghuo, Shaofeng and Chengdu brands.

AUTHOR: None

ORG: None

TITLE: "The No 713 Meteorological Radar"

SOURCE: Beijing DIANZI SHIJIE [ELECTRONICS WORLD] in Chinese No 7, 1980  
front cover

ABSTRACT: The No 713 meteorological radar can detect such phenomena as thunderstorms and extensive precipitation within a range of 400 km. It can detect the intensity and altitude of development of precipitation and show areal distribution of precipitation intensity. It uses integrating and level display methods, and in one revolution of the antenna it can produce a 7-level intensity display. It is produced by the National Changhai Machinery Plant.

AUTHOR: None

ORG: None

TITLE: "A Cradle of High-Level Electronics Industry Personnel: The Guilin Academy of Electronics Engineering"

SOURCE: Beijing DIANZI SHIJIE [ELECTRONICS WORLD] in Chinese No 7, 1980  
inside front cover

ABSTRACT: The Guilin Academy of Electronics Engineering was recently founded to give a higher education to electronics personnel. It is run by the Fourth Ministry of Machine Building. It has three departments: electronics machinery, electronics engineering, and electronic computers, each with two specialties, all offering a four-year course. The school invites applications from 15 provinces, cities and autonomous regions. Classroom and laboratory activities and a general view of the school are shown.

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CSO: 4009

AUTHOR: LU Jiping [6424 1323 1627]

ORG: Mathematics Department

TITLE: "On the Motion of the Stationary Nonlinear Flow with the Viscosity"

SOURCE: Qingdao SHANDONG HAIYANG XUEYUAN XUEBAO [JOURNAL OF SHANDONG COLLEGE OF OCEANOLOGY] in Chinese Vol 10 No 2, Jun 80 pp 1-6

TEXT OF ENGLISH ABSTRACT: This article is devoted to the study of the problem of stationary nonlinear flow

$$\begin{cases} -\nu \Delta V + \omega_K V_{X_K} + A(x) \times V = -\text{grad} p + f(x), \\ \text{div} V = 0, \\ V|_S = 0. \end{cases}$$

In the case of the small Reynolds number and small Coriolis force, using the Leray-Schauder theorem, the existence and uniqueness theorems for generalized solutions have been proved. When  $A(x) = 0$ , the condition (15) of uniqueness of the solutions is better than the corresponding conditions given in the articles by Ladyzhenskaya and Shen.

AUTHOR: SUN Wenxin [1327 2429 1800]  
QIN Zenghao [4440 2582 3493]  
FENG Shizuo [7458 1102 460A]

ORG: All of the Department of Physical Oceanology

TITLE: "Numerical Modeling of an Ultra-Shallow Water Storm Surge (II)--The First-Order Model of the Bohai Sea Wind Surges"

SOURCE: Qingdao SHANDONG HAIYANG XUEYUAN XUEBAO [JOURNAL OF SHANDONG COLLEGE OF OCEANOLOGY] in Chinese Vol 10 No 2, Jun 80 pp 7-19

TEXT OF ENGLISH ABSTRACT: Based on the numerical scheme presented in a previous article, a numerical simulation of the Bohai Sea wind surges treated as a first-order model of the ultra-shallow water storm surges is suggested and examined. Also, a comparison between the numerical results and some observations is made.

AUTHOR: WANG Binhua [3769 1755 5478]

ORG: Department of Physical Oceanology

TITLE: "The Continuation and Dissipation of Sea Fog Along the China Coast and Its Vicinity"

SOURCE: Qingdao SHANDONG HAIYANG XUEYUAN XUEBAO [JOURNAL OF SHANDONG COLLEGE OF OCEANOLOGY] in Chinese Vol 10 No 2, Jun 80 pp 20-30

TEXT OF ENGLISH ABSTRACT: Using air stability and weather patterns, we discuss the continuation and dissipation of sea fog. From this we find, under certain conditions, the existence of a "dry layer" in the lower air which is available for fog continuation, while on the other hand, sea fog always dissipates after the wind (direction and velocity) and precipitation from changed weather patterns.

AUTHOR: ZUO Zhongdao [1563 0022 6670]

ORG: Department of Physical Oceanology

TITLE: "Dynamic Calculations and the Mechanism for Hard Rain of a Typhoon under the Influence of the Synoptic System of the Westerly Belt"

SOURCE: Qingdao SHANDONG HAIYANG XUEYUAN XUEBAO [JOURNAL OF SHANDONG COLLEGE OF OCEANOLOGY] in Chinese Vol 10 No 2, Jun 80 pp 31-44

TEXT OF ENGLISH ABSTRACT: In this paper, the precipitation model consisting of equations of continuity and the formula of wet adiabatic rainfall rate have been used to calculate the rainfall of two typhoons which are invaded by the westerly belt synoptic system. Both calculated regions and intensity agree with that of real precipitation. A new gale center is generated near the lower troposphere of the westerly belt system when it has partly invaded the region of the typhoon. Hard rain occurs in the lower layer convergence region of downwinds at the gale center. From the calculation of energy conversion, it is found that this gale center is generated by baroclinic conversion of potential energy into kinetic energy.

\* Also taking part in the present study were: LI Xuejian [2621 1331 0494], LIN Yunkang [2651 6663 1660], ZENG Xin [2582 1800], YU Zhifeng [0151 1807 1496] and WU Zhengxin [0702 2973 2450].

AUTHOR: WANG Sizhen [3769 6337 7201]

ORG: Department of Physical Oceanology

TITLE: "A Note on Typhoon Westward Motion Caused by Vorticity Transference"

SOURCE: Qingdao SHANDONG HAIYANG XUEYUAN XUEBAO [JOURNAL OF SHANDONG COLLEGE OF OCEANOLOGY] in Chinese Vol 10 No 2, Jun 80 pp 45-50

TEXT OF ENGLISH ABSTRACT: A steady, axisymmetric typhoon model based on observations of the Atlantic hurricanes and the Pacific typhoons has been used to discuss the details of typhoon westward motion caused by vorticity transference. The results are compared with the effect of typhoon "internal force."

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TITLE: "A Preliminary Study on Air-Sea Turbulent Energy Exchange"

SOURCE: Qingdao SHANDONG HAIYANG XUEYUAN XUEBAO [JOURNAL OF SHANDONG COLLEGE OF OCEANOLOGY] in Chinese Vol 10 No 2, Jun 80 pp 51-62

TEXT OF ENGLISH ABSTRACT: During May and June of 1978, two runs of measurements of mean wind speed, temperature and humidity profiles in the first 5.2 m of the marine atmosphere were made in Jiaozhou Bay near Qingdao. Based on the obtained data, the vertical distribution characteristics of the mean wind speed, temperature and humidity were analyzed. The calculated results lead to the following main conclusions: when the wind is not greater than Beaufort scale 5, the magnitude of the sea surface roughness  $Z_0$  ranges from 0.001 cm to 1 cm, the friction velocity  $U_*$  increases with wind speed at the reference level (9 m), and the bulk drag coefficient  $C_D$  (at 9 m) is independent of wind speed, its typical value being about  $2.0 \times 10^{-3}$ .

\* The following persons from our department also took part: WANG Weixin [3769 4850 2450], XU Liezhong [1776 3525 1813] and ZHAO Yuzhi [6392 3768 5347].

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ORG: All of the Department of Oceanological Chemistry

TITLE: "A Study of the Mutual Non-Interference Effect of Inorganic Ion Exchange in Seawater. I. Ion Exchange Reactions of U(VI), Cr (III), Ca, Mg with Hydrous Titanium Oxide in Seawater"

SOURCE: Qingdao SHANDONG HAIYANG XUEYUAN XUEBAO [JOURNAL OF SHANDONG COLLEGE OF OCEANOLOGY] in Chinese Vol 10 No 2, Jun 80 pp 63-80

TEXT OF ENGLISH ABSTRACT: The results obtained in this article by study of mutual non-interference effect of inorganic ion exchange in seawater are:

1. On the basis of experiments conducted in this article, we propose that in the inorganic ion exchange reaction in seawater there is a mutual non-interference effect, viz. the presence of other ions in seawater has no effect on the final exchange quantity of the ion under consideration on the inorganic exchange. During the reaction, the ion exchange exhibits an "independent," mutually non-interfering action. The systems studied in our experiment are: (1) ion exchange reaction of uranium (under conditions of a large quantity of

[Continuation of SHANDONG HAIYANG XUEYUAN XUEBAO Vol 10 No 2, Jun 80 pp 63-80]

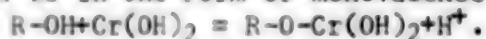
chromium) with hydrous titanium oxide;

(2) ion exchange reaction of chromium (under conditions of a large quantity of uranium) with hydrous titanium oxide;

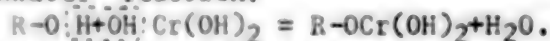
(3) ion exchange reaction of uranium (under conditions of a large quantity of calcium) with hydrous titanium oxide;

(4) ion exchange reaction of uranium (under conditions of a large quantity of magnesium) with hydrous titanium oxide.

2. The mechanics of the reaction of Chromium (III) with hydrous titanium oxide in seawater have been studied in detail. It has been determined that one of the steps in the chemical reaction is that of cation ion exchange. From the "ratio of exchange (%)--PH graph" it is possible to deduce further that the reaction is in the form of monovalence cation exchange:



In addition, the reaction can also be explained by the mechanics of "complexation-dewater" reaction:



3. The stepwise equilibrium constants of Chromium (III) with hydrous titanium oxide in seawater have been determined by experiments, the results being:

$$K_1 = 1 \times 10^4 (\mu g/g \text{ extracting agent. } -ppm)$$

$$K_2 = 3.5 \times 10^6 (\mu g/g \text{ extracting agent. } ppm^2)$$

These results agree well with Keen's enrichment coefficients.

4. The mechanics of the reaction of Chromium (VI) with hydrous titanium oxide in seawater have also been studied. From the "ratio of exchange (%)--PH graph" it is possible to deduce further that the reaction is in the form of anion ion exchange:



The equilibrium constant of Chromium (VI) with hydrous titanium oxide in seawater has been determined by experiments, the results being:

$$K_1 = 1.9 (\mu\text{g/g extracting agent, ppm})$$

5. The above results will exhibit their theoretical guiding effect in the marine geochemistry of Chromium.

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TITLE: "The Distribution and Seasonal Change of Dissolved Oxygen in the South Yellow Sea"\*

SOURCE: Qingdao SHANDONG HAIYANG XUEYUAN XUEBAO [JOURNAL OF SHANDONG COLLEGE OF OCEANOLOGY] in Chinese Vol 10 No 2, Jun 80 pp 81-90

TEXT OF ENGLISH ABSTRACT: The periodic variation of dissolved oxygen in seawater can be expressed by a Fourier series

$$Y = A_0 + \sum_{m=1}^n A_m \cos(m\omega t - \phi_m).$$

The distribution of annual average value ( $A_0$ ), constants of annual and semi-annual ( $A_m, \phi_m$ ) dissolved oxygen in the surface water and a vertical section of the South Yellow Sea have been described. The parameters in the surface water, subsurface water and Yellow Sea cold water mass have also been discussed.

\* LI Fuhong [2621 0102 7703] also took part in the study.

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TITLE: "Oxygen Exchange Between Air and Sea in the South Yellow Sea"

SOURCE: Qingdao SHANDONG HAIYANG XUEYUAN XUEBAO [JOURNAL OF SHANDONG COLLEGE OF OCEANOLOGY] in Chinese Vol 10 No 2, Jun 80 pp 91-100

TEXT OF ENGLISH ABSTRACT: Oxygen exchange between air and sea in the South Yellow Sea (two stations) has been studied based on the seasonal variation of dissolved oxygen in seawater. The oxygen exchange rate was obtained according to the variation of the amount of oxygen in the mixed layer column from surface to thermocline layer of seawater. It showed that oxygen transferred from the atmosphere to the seawater with an average exchange rate of  $5.2 \times 10^{-7} \text{ ml cm}^{-2} \text{ sec}^{-1}$  from September of February of the next year which was equal to loose oxygen from seawater during March to August. The values of the exchange coefficient ranged from about 0.5 to 9.5  $\text{cm sec}^{-1}$  (mean value  $4.5 \times 10^{-3} \text{ cm sec}^{-1}$ ). The thickness of the laminar layer was from about 16 to 244 m (mean value  $75 \pm 69 \mu\text{m}$ ).

AUTHOR: ZHU Erqin [2612 5079 0430]

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TITLE: "Analysis of Paleostream System During Early Oligocene in Dong-ying Depression, Shengli Oilfield"

SOURCE: Qingdao SHANDONG HAIYANG XUEYUAN XUEBAO [JOURNAL OF SHANDONG COLLEGE OF OCEANOLOGY] in Chinese Vol 10 No 2, Jun 80 pp 101-112

TEXT OF ENGLISH ABSTRACT: The Dong-ying Depression is an important producing area of the Shengli oilfield and belongs to a block-faulting basin in the Tertiary. According to researching and correlating of the core, column sections and various experimental analytic data, this article divided the third and second groups of the Shahejie Formation (Oligocene) in the Dong-ying Depression into three paleostream depositional systems:

- 1) Paleo-Luxi System, which is situated in the south of this basin, covering three-fifths of the total area;
- 2) Paleo-Chen-zhuang System, which is located in the northwest; and
- 3) Paleo-Yong-an-zhen System, which is lying in the northeast, the former two systems covering two-fifths of the area of the depression.

On the basis of the above divisions, the evolution of the Paleo-Chen-zhuang

[Continuation of SHANDONG HAIYANG XUEYUAN XUEBAO Vol 10 No 2, Jun 80 pp 101-112]

River is studied in detail and its dynamical parameters are calculated. It is shown that this paleostream is a braided one with paleo-velocities of 35-42 cm/sec, width of 181 m, depth of 1 m, discharge of 126.3 m<sup>3</sup>/sec, and ratio of  $\sqrt{W/D}$  of about 15.

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